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CONTRIBUTORS TO THIS NUMBER

- CARL BECK, M. D., Surgeon-in-Chief, North Chicago Hospital
- ARTHUR DEAN BEVAN, M. D., Professor of Surgery, Rush Medical College, in affiliation with the University of Chicago; Surgeon to the Presbyterian Hospital.
- FREDERICK CHRISTOPHER, M. D., Assistant Surgeon, St. Luke Hospital, Assistant in Experimental Surgery, University of Illinois Medical School.
- CAREY CULBERTSON, M. D., Assistant Professor of Gynecology and Obstetrics, Rush Medical College; Assistant Attending Gynecologist and Obstetrician, Presbyterian Hospital, Attending Gynecologist, Cook County Hospital.
- CARL E. DAVIS, M. D., Associate Professor of Surgery, Rush Medical College; Associate Attending Surgeon, Presbyterian Hospital.
- FREDERICK G. DYAR, M. D., Associate Professor of Surgery, University of Illinois, Attending Surgeon, Cook County Hospital.
- DR. GATEWOOD, Instructor in Surgery, Rush Medical College; Assistant Attending Surgeon, Presbyterian Hospital.
- JAMES C. GILL, M. D., Associate Professor of Medicine (Obstetrics and Mental), Rush Medical College.
- ALBERT HALSTED, M. D., Senior Attending Surgeon, St. Luke Hospital, Professor of Clinical Surgery, University of Illinois Medical School.
- ROBERT H. HERBERT, M. D., Assistant Professor of Genito-urinary Surgery, Rush Medical College; Attending Urologist, Presbyterian Hospital.
- ALLEN R. KANAVEL, M. D., Assistant Professor of Surgery, Northwestern University Medical School; Attending Surgeon, Wesley Memorial Hospital.
- HERMAN L. KRETSCHMER, M. D., Urologist, Presbyterian Hospital, Assistant in Genito-urinary Surgery, Rush Medical College.
- HUGH MCKENNA, M. D., Senior Surgeon and President of Staff, St. Joseph Hospital; Associate Professor of Surgery (Edgewater), Rush Medical College.
- GOLDEN LEWIS McWHIRTER, M. D., Instructor in Surgery, Rush Medical College; Assistant Attending Surgeon, Presbyterian Hospital.
- CHARLES LOUIS MEEK, M. D., Professor of Medicine and Head of the Department of Medicine, Loyola University Medical School, Senior Attending Physician, Mercy Hospital.
- ALBERT J. OCHNER, M. D., Surgeon-in-Chief, Assistant and St. Mary's Hospital, Professor of Clinical Surgery, College of Medicine, University of Illinois.
- J. RAWBURN FLEMING, M. D., Surgeon to Columbia Hospital and United States Veterans Hospital No. 21.
- GEORGE SHAMBAUGH, M. D., Professor of Otolaryngology, Rush Medical College; Otolaryngist to the Presbyterian Hospital.
- KELLOGG SPEED, M. D., Assistant Professor of Surgery, Rush Medical College; Associate Attending Surgeon, Presbyterian Hospital; Surgeon to Cook County and Psychiatrist Hospital.
- DAVID C. STRAUSS, M. D., Assistant Professor of Surgery, Rush Medical College; Attending Surgeon, Cook County Hospital, Associate Attending Surgeon, Michael Reese Hospital; Director of the Hospital Department, Michael Reese Dispensary.
- ALFRED A. STR. UHL, M. D., Michael Reese Hospital.
- LEIGH WATSON, M. D., Associate in Surgery, Rush Medical College.

THE SURGICAL CLINICS OF NORTH AMERICA

Volume 2

Number 3

CLINIC OF DR. ALBERT J. OCHSNER

AUGUSTANA HOSPITAL

REMOVAL OF RENAL CALCULUS FROM PELVIS OF FLOATING KIDNEY THE SECOND KIDNEY BEING ABSENT

Patient Who Had Had a Nephrectomy Two Years Previously Returns to Hospital Because of Attacks of Renal Colic on the Opposite Side, with Bloody Urine and the Passage of a Sharply Pointed Stone. Physical Examination Showed Presence of Floating Kidney Operation Removal of Stone from Lower Calix of Kidney After-history

On June 27 1919 after eleven days of symptoms, the patient underwent a nephrotomy and five stones were removed from the left kidney Twenty three days later she was discharged as recovered. At this time x ray plates of the right kidney had showed no stones and there were no signs or symptoms referable to the right kidney On May 6 1921 she returned to the hospital complaining of dull aching pains in the left kidney region. These were worse at night but were never sharp or colicky and did not radiate and there was no history of bloody urine She had noticed cloudy urine and there was nocturia (two or three) otherwise the urinary history was negative. Her general health had not been good for nearly two years—nervousness insomnia, rapid heart and dyspnea on exertion occasional sharp pains through the heart, migrating headache and slight dizziness. There was no falling of vision, blood-pressure was 145/95 and though the patient said she could swell no edema was

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In the right upper quadrant a large rounded mass which he interpreted as kidney and which on being placed upward and to the right disappeared completely. Soon after this 1 pint of clear urine was passed. There was no history of jaundice and the gastric history is not remarkable.

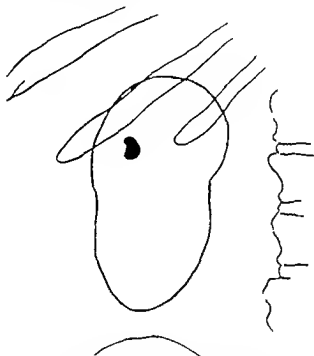


Fig. 256.—Tracing from roentgenogram of right kidney taken October 28, 1921 showing the presence of large stone

After entering the hospital the same pains as felt before on two occasions have continued, and x-ray examination of the right kidney shows a large stone (Fig 256). There is tenderness over the right costovertebral angle. The general physical examination reveals nothing in addition to that detailed in connection with the previous entrance. The mass in the right upper abdomen is not present.

found. The general physical examination was essentially negative save for moderate obesity, a slightly enlarged and otherwise not remarkable heart, a well-healed left nephrotomy scar. At the examination no tenderness was elicited anywhere in the abdomen or back and there were no masses. x Ray of the left kidney showed two stones (Fig 255). On May 9th the left kidney was removed and on June 19, 1921 she was discharged as recovered.

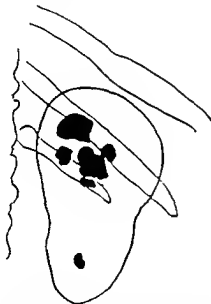


Fig. 255.—Tracing from roentgenogram of left kidney in June, 1919, preceding the nephrotomy. Note the location of the five stones.

On October 26, 1921 she returned to the hospital with the following story: On September 1, 1921, she was taken with severe agonizing pain in the right flank, radiating to the right groin. There was bloody urine, and a few days later the patient passed a sharply pointed stone the size of a pea. She remained well until October 22d, fourteen days before her entrance, when similar severe pains set in. Her physician was called and found

placement of the kidney to any position in which kinking of the ureter might result (c) we must not traumatize the kidney tissue (d) we must guard against future obstruction of the ureter due to cicatricial contraction (e) we must not prolong the operation sufficiently to produce a severe degree of exhaustion (f) we must guard against postoperative infection. This last has been provided against by the administration of 5 grains of urotropin in a glass of distilled water given every three hours for two days preceding the operation.

Operation.—The patient has been given a hypodermic injection of $\frac{1}{2}$ gr of morphin and $\frac{1}{128}$ gr of atropin one hour before and $\frac{1}{4}$ gr of morphin and $\frac{1}{256}$ gr of atropin fifteen minutes before applying the local anesthetic.

The skin and all the tissues down to the kidney are then thoroughly injected with $\frac{1}{2}$ per cent. solution of novocain 2 ounces being injected.

After waiting for fifteen minutes the kidney is exposed by making a curved incision extending downward from the twelfth rib and then curving forward directly above the anterior superior spine (Fig 257) splitting the latissimus dorsi and quadratus lumborum muscles and remaining behind the ilioinguinal nerve (Fig 257)

Upon exposing the perinephritic fat capsule the latter is torn and the finger is passed behind the kidney then forward until the upper end of the ureter is reached, where it issues from the pelvis of the kidney

The wound is retracted forward so as to make it possible to hold the kidney forward and expose the upper end of the ureter and the pelvis of the kidney

An incision is now made 2 cm. long splitting the ureter longitudinally and extending one-third of its length into the pelvis of the kidney

The end of the forefinger is now passed into the pelvis of the kidney and an oblong stone $1\frac{1}{2}$ cm. long 1 cm. wide and 8 mm. thick is located freely movable in the lower calix of the kidney

It is doubtful whether the stone has been in this location for some time or whether it was forced into this position at the time

This patient gives a typical history of intermittent hydro-nephrosis with complete anuria, which was relieved by manipulation of the only kidney she has.

Were it not for the fact that the skiagram shows the shadow of a stone the anuria could reasonably be attributed to a kink in the ureter in a case of floating kidney in a patient whose other kidney had previously been removed.

The kidney can be moved from its normal position down to a point opposite the anterior superior spine of the ilium. The x-ray shadow shows a stone too large to pass through the ureter and even though the stone were much smaller it would scarcely be safe to risk its passing through the ureter because during its passage it might cause a temporary obstruction of sufficient duration to produce a fatal uremia.

Of course with all of these facts before us the case would not be hopeless even in event of complete obstruction due to an impaction of a stone in the ureter because a pyelotomy which could be performed under local anesthesia with $\frac{1}{2}$ per cent. solution of novocain would relieve the retention of urine so that the stone could later be removed when the patient had recovered from the harm done by the temporary obstruction.

Each one of these repeated obstructions must however result in a certain degree of injury to the kidney and consequently the patient can never be in a more favorable condition for operation than at the present time.

In planning this operation it seems important to relieve the kidney as much as possible of any irritation.

This can be accomplished by giving buttermilk and fruit juices for nourishment and by keeping the colon free from decomposing fecal material by giving 1 ounce of mineral oil in cream or in fruit juice morning and evening and giving 2 ounces of castor oil on the morning of the day before the day of the operation.

Aside from this she should take at least 2 quarts of distilled water each day.

In planning the steps of the operation we must accomplish (1) the removal of the stone (2) we must prevent future dis-

being taken not to traumatize calyx, pelvis or ureter. The edges of the wound in the ureter come together perfectly.

A gauze sponge is placed opposite the incision in the ureter while the remaining steps of the operation are being carried out. In order to prevent future kinking of the ureter the following method of nephropexy is employed. The capsule of the kidney is split longitudinally from pole to pole and reflected for a distance of 2 cm. on each side of the incision (Fig. 257).

Eight chromicized catgut sutures are then applied four on each side the lower three sutures on each side grasping the capsule and the aponeurosis of the muscle and the upper two sutures being passed through the capsule and then around the twelfth rib. Care is taken in each instance to secure a broad bite in the capsule.

The gauze sponge which has been placed opposite the incision in the ureter and pelvis is now removed and a rubber drain $\frac{1}{4}$ cm. in diameter together with two cigarette drains, are introduced down to the ureter and brought out through the lower end of the incision.

The wound is sutured carefully in layers with catgut and with six deep silkworm sutures and a large dressing applied.

Progress of Case—A small amount of urine up to 15 ounces in twenty four hours passed through the ureter into the bladder each day until the third week, most of the urine passing out through the wound during two weeks.

The cigarette drains were removed on the ninth day and the drain on the eleventh day after the operation. The deep silkworm sutures were removed on the sixteenth day. On the twenty-second day the patient sat up. Until this time she had been normal as to pulse and temperature and free from pain.

On the twenty-third day but 2 ounces of urine were passed from the bladder and the patient suffered pain in the region of the kidney where a large mass could be felt. There was practically no drainage from the wound.

On the twenty fourth day the patient appeared severely ill there was no increase of urine from the bladder and none from the wound.

when the hydronephrosis was relieved by the manipulations necessary to replace the kidney as mentioned in the history or

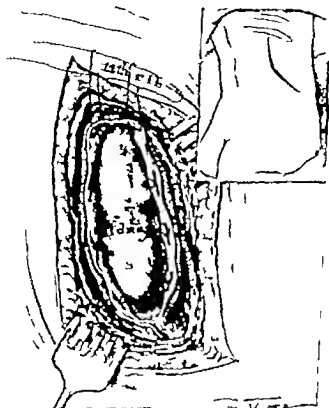


Fig. 257.—Drawing showing outline of operation. The incision is composed by curved incision extending down and from the twelfth rib and then curving forward directly above the anterior superior spine. The latissimus dorsi and quadratus lumborum muscles are split and care is taken not to injure the ilio-lumbar nerve. The method of closure also shown.

whether this was accomplished during the manipulations incident to the operation.

The stone is removed by means of a blunt spoon great care

been damaged, and there can be no doubt but what this adds a further element predisposing to the formation of renal calculi.

There is undoubtedly a strong element of predisposition, for many persons may live under the same conditions, eat the same food and drink the same water and only a few of them may develop kidney stone. But those who have once developed stones are very likely to develop others unless the above precautions are taken.

Experience shows that in certain regions a considerable proportion of the population suffers from stone while in other communities stone appears seldom or never.

It has been claimed, for instance, that the wheat eaters in India suffer from stone while the rice eaters remain free. It must be remembered however that wheat will not continue to produce profitable crops in soil which does not contain lime while rice will grow in alluvial soil so long as it is properly supplied with water.

Consequently it may not be the wheat they eat, but the lime they drink in the water which produces the stone.

There are however many natural waters that are famous for their ability to prevent the recurrence of stone but in the use of all of these waters, as in the use of distilled water it is important to drink at least 2 liters each day and to be quite regular in this practice.

In the after-treatment of this patient there can be no doubt but that the drain which led down to the incision in the ureter and pelvis should have been left in place until practically all of the urine had passed out through the bladder because undoubtedly it was the pressure of urine on the outside of the injured ureter which caused the obstruction in the ureter on the twenty fourth postoperative day?

Again, after the removal of the left kidney the patient should have been impressed with the danger of neglecting the drinking of at least $\frac{1}{2}$ gallon of distilled water because this would undoubtedly have prevented the formation of the stone in the right kidney.

A pair of curved forceps were passed down to the pelvis of the kidney through the wound, resulting in a spurt of urine—about 60 c.c. in quantity. Following this there was no urine passed from the wound for twenty-four hours, when it began to flow freely and immediately it began to pass through the bladder. From this time on the amount passed through the bladder increased from day to day while the amount passed through the wound decreased correspondingly.

Within three weeks the wound stopped draining and the urine passed normally through the bladder.

The patient was discharged well eight weeks from the day she was admitted.

In order to prevent the formation of more renal stones she has been advised to drink at least $\frac{1}{2}$ gallon of distilled water each day during the remainder of her life. It has been our experience that none of our patients have ever had a recurrence of renal calculi if they have observed this rule although they may have had many recurrences before. Other patients have remained free from stones for years while following this rule only to suffer from recurrence upon returning to the use of ordinary well water rich in lime.

A few others again, have remained free from stone so long as they drank $\frac{1}{2}$ gallon of distilled water every day while they had a recurrence after going for weeks or months without drinking anything except the fluids they got in coffee, tea or soup together with only a little distilled water daily.

It has been claimed that some articles of food such as milk, contain much lime hence the amount taken in drinking water cannot be of much importance.

This argument is of course of no value because every cook knows that she can boil milk in the same crock for years without ever accumulating any lime while a few weeks of boiling hard drinking water will invariably precipitate lime in the tea-kettle.

With our patient it is of course more important than in ordinary cases that these precautions be followed because the pelvis of the only kidney she has left and her ureter have both

CLINIC OF DR. ALLEN B. KANAVEL

WEEKLY MEMORIAL HOSPITAL

RETROPHARYNGEAL AND POSTERIOR MEDIASTINAL ABSCESSSES

Cold Abscesses Secondary to Tuberculous Disease of the Cervical and Dorsal Vertebrae May Cause Serious and Widespread Involvement Because of Their Tendency to Gravitate Downward Into the Posterior Mediastinum. According to Their Location, They Should be Drained as Early as Recognized, in the Neck or Through a Dorsal Approach. Frequently They May Be Evacuated and Closed with Complete Remission of Symptoms.

It is my purpose to present to you today 2 patients suffering with abscesses—one in the retropharyngeal space and the other in the posterior mediastinum. The first patient we will operate upon by the method which we believe should be used in opening these abscesses. The second patient has been under our observation for two years. Originally she suffered from a tuberculosis of the spinal column and an abscess in the posterior mediastinum, which was drained by operation. I have asked her to return today that I may discuss with you the surgical considerations involved in the treatment of these abscesses since they are of a similar nature.

The patient to be operated upon today is a child eleven years of age who has been suffering for over nine months with tuberculous lesions of different parts of the body. We have already drained a tuberculous abscess of the upper lid, one of the hand and another of the abdomen. He now comes with a swollen gland on the right side of the neck lying at the bifurcation of the carotid and in addition, a swelling in the retropharyngeal

CLINIC OF DR. ALLEN B. KANAVEL

WESLEY MEMORIAL HOSPITAL

RETROPHARYNGEAL AND POSTERIOR MEDIASTINAL ABSCESSSES

Cold Abscesses Secondary to Tuberculous Disease of the Cervical and Dorsal Vertebrae May Cause Serious and Wide-spread Involvement Because of Their Tendency to Gravitate Downward Into the Posterior Mediastinum. According to Their Location, They Should be Drained, as Early as Recognized in the Neck or Through a Dorsal Approach. Frequently They May Be Evacuated and Closed, with Complete Remission of Symptoms.

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space evident by inspection when the mouth is open, and easily demonstrable by palpation with the finger. This in all probability is the result of tuberculous disease of the cervical vertebrae although the x-ray picture is not conclusive. Retropharyngeal abscesses not infrequently appear as a result of a tuberculosis of the cervical vertebrae though they are more commonly associated with acute infections of the pharynx in young children. In the former instance particularly a serious error is often made in that these abscesses are opened through the mouth and, as a result we have an open wound connected with a tuberculous cavity resulting in long-continued suppuration and often in death. Tuberculous abscesses here as elsewhere in the body should be opened in such a manner as to prevent secondary infection. Opening them through the mouth is a serious technical error.

We make an incision $2\frac{1}{2}$ inches in length along the anterior border of the sternocleidomastoid muscle. The muscle is retracted and we come upon a large gland the size of a walnut which fortunately can be enucleated intact. We now see in the floor of the field the internal jugular vein and the common carotid artery. These we will retract laterally. Since the superior thyroid artery is preventing free retraction, I will ligate and divide it between ligatures since the collateral circulation is so free that it must be ligated both proximally and distally. We now see at this point a bulging mass (Fig. 253). I am in some doubt as to its relation to the pharynx. In fact, it may be the bulging wall of the pharynx itself. I will, therefore ask my assistant to place his finger in the mouth and outline for me the pharyngeal wall. This permits me to dissect posteriorly to the pharynx. Here we come at once upon the abscess and open it widely with forceps. As you see a considerable amount of thick green pus is evacuated. My palpating finger does not demonstrate an erosion of bone. I shall swab the cavity carefully with sterile gauze so as to remove all detritus and close the wound in later so that there may be no possibility of contamination from the skin.

It is readily seen that this method is similar to that used in opening pyogenic abscesses or other tuberculous abscesses where

we wish to prevent secondary infections. The history of these patients shows that not uncommonly the wound heals kindly and the patient makes an immediate recovery as far as the local abscess and pressure symptoms are concerned. In this partic

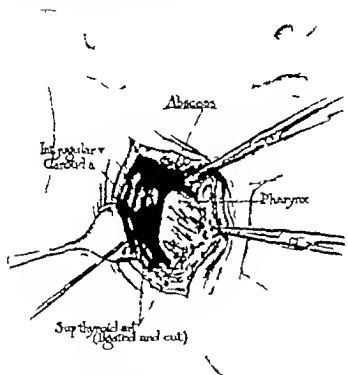


Fig. 258—Method of approach for drainage of retropharyngeal abscess through the neck.

ular type of case it prevents first the rupture of the abscess into the pharyngeal cavity and, second a serious secondary infection.

Note—Section of the gland showed it to be a caseating tuberculous lymph-gland with a central cavity filled with greenish-yellow pus. The stitches were removed one week later at which time the wound was well healed (Fig. 259)

In considering the technic of draining this abscess it is well to draw attention to the fact that any abscess lying in the posterior pharyngeal space even extending down as far as the third and fourth dorsal vertebrae can be opened and drained by this approach. It has long been recognized as a proper surgical procedure. Lurmann, as long ago as 1876 operated upon a patient who had a deep abscess in the left side of the neck following a



Fig. 239.—Photograph of patient (Case I) showing appearance of localized abscess.

pharyngeal phlegmon. Fortunately it did not rupture in the pharynx, but fluctuation appeared at the anterior border of the sternocleidomastoid muscle. Incision was made here and a pint of foul-smelling pus evacuated. Through this opening the chest was examined and it was found that the cavity extended down into the postero-mediastinal space for considerable distance. The cavity was filled with fluid and was

found to hold 2 quarts. A fistula had formed low down in the esophagus so that for two weeks after operation food appeared in the wound. The patient, however made a slow but eventful recovery.

Zleinbreckl in 1895 in the bulletin of the Surgical Society of Paris, reported the case of a patient who developed a sudden pain in the neck with dysphagia. Esophageal sounds were passed for a few days. It was then noted that the patient had fever, fetid breath and a peculiar configuration of the neck, as though the increased size were due to a pharyngeal and laryngeal edema. The diagnosis of prevertebral septic phlegmon was made and operation demonstrated an abscess beneath the deep fascia, as well as a cavity between the esophagus and the vertebra with pieces of bone in it. The patient was fed with an esophageal tube while in the hospital and discharged with a small fistula still present. After leaving the hospital he began to take food by mouth and soon returned with a recurrence of the abscess in the posterior mediastinum. At the autopsy following his death, three months later a small fistula was found in the posterior wall of the esophagus just below the pharynx. The abscess which resulted had denuded and eroded the vertebral bodies of the cervical and dorsal vertebrae and extended well into the posterior mediastinum.

Von Hacker in 1901 described practically a similar incision with the report of 2 cases. Von Hacker recognized that in the presence of an extensive abscess it is wise to do a preliminary gastrostomy because of the esophageal perforation which frequently exists in these cases.

Rasumowski in 1900 reported in Hildebrandt's Jahresbericht the case of a patient twelve years of age who had an abscess that extended 14 cm. into the posterior mediastinum, and that communicated through a small opening with the trachea. He recommended that these patients should be placed in the Trendelenburg position after operation and fed with a tube—manifestly a very wise procedure if there is either an esophageal or tracheal fistula since the first measure tends to aid in drainage and the second prevents repeated contamination.

Cavazzini in 1893 also reported a case with esophageal fistula. In this patient a cervical operation was first performed, and later a dorsal incision was made for better drainage. From his experience he recommends both operations as routine—first incision in the neck and later dorsal mediastinotomy. This is unnecessary unless the abscess is of great size and the convalescence slow since the Trendelenburg position with tube feeding or gastrostomy will usually result in recovery.

Gaudiani reported the case of a patient with dysphagia and a swollen mass in the left side of the neck, evidently an abscess, which was opened under local anesthesia anterior to the sternocleidomastoid. A drain was inserted which ran down into the posterior mediastinum for 9 inches. The patient was placed in the Trendelenburg position and the wound healed in two months. He reported a second case—a patient who swallowed a fish bone which penetrated the posterior part of the esophagus in its upper portion. A retropharyngeal abscess developed which was drained by the same method. Death occurred two days later and at autopsy a perforation of the trachea and bronchopneumonia were found. He is of the opinion that a cervical incision may be made to drain abscesses extending as low as the arch of the aorta but in those patients in whom the abscess lies below the fourth or fifth dorsal vertebra dorsal incision should be made.

It is evident from this review that if secondary infection develops as the result of a perforation of the abscess into the pharynx or esophagus, we are dealing with a much more serious condition than that in which the abscess has not yet ruptured or has not been opened in the pharynx. Had this abscess been opened through the pharynx or had perforation taken place as would inevitably occur if the abscess were left to itself we would probably have had a secondarily infected retropharyngeal abscess which would have required drainage through the neck. It would have been advisable then to have placed this child in the Trendelenburg position to secure dependent drainage and either to do a gastrostomy or feed the child through a stomach tube. The increased hazard for the patient under such

conditions and the added difficulties in carrying out adequate treatment, emphasize the importance of careful diagnosis and early operation in these patients.

Let me now present this patient, Miss S. Wesley Memorial Hospital, No. 79 028 who has returned at my request. She came to us first two years ago with a tuberculous of the sixth, seventh, and eighth dorsal vertebrae. During the course of the treatment it was necessary to drain an abscess in the posterior mediastinum, and it is because of this complication that I am drawing her case to your attention.

At the time we first saw her two years ago she had evidence of tuberculous of the vertebrae mentioned, with marked spasticity of the muscles of both lower extremities. The left thigh and leg were rigidly flexed and she was unable voluntarily to extend them. Voluntary abduction and adduction of the thighs were impossible. She had ankle-clonus and exaggerated patellar and ankle-jerks, a bilateral Babinski, Oppenheim, Gordon and Chaddock. Muscle and joint sense of the toes were absent.

From this summary of the findings at that time it is evident that she was suffering from compression of the spinal cord. It was thought advisable to immobilize the spine and this was done by a typical Albee operation, followed by prolonged rest in bed. Although the operation was successful in immobilizing the spine and was followed by a temporary remission of her symptoms of spasticity she returned to us three months afterward in even worse condition than upon her first admission. The spasticity was more marked and there was evidence of a more complete sensory involvement. While at home she had gradually lost the use of both lower limbs and developed severe pains in the calves and thighs. These symptoms abated somewhat, so that at the time of her second admission to the hospital it was found there was some tenderness at the site of the dorsal swelling, and absolute spastic rigidity of the lower extremities. There was a diminution of sensation below the tenth dorsal segment on the left and the eleventh on the right with absence of pain in the lower extremities. There was a zone of hyperesthesia at the level of the ninth and tenth dorsal vertebrae. The bowels and

bladder were normal. The upper extremities were normal. An x-ray picture taken at this time disclosed an oval shadow the size of a lemon in front of the body of the seventh dorsal verte



Fig. 260 — Roentgenogram (Case II) — anteroposterior view showing outline of mediastinal lesion

bra and contiguous to it lying apparently somewhat more upon the right side than upon the left (Figs. 260-261). A diagnosis of tuberculous abscess of the posterior mediastinum at this time was made. At operation an incision was made from the level of

the fourth to the ninth dorsal spines, about 4 cm. to the right of the midline. The tissues were retracted medialward so as to



Fig. 261.—Roentgenogram (Case II) lateral view showing outline of mediastinal abscess.

expose the neck of the seventh and eighth ribs and the internal intercostal muscles just lateral to the erector spinae group. The periosteum was separated from the seventh rib and a small piece

of this removed as close to the spine as possible. In passing through the anterior layer of the periosteal covering the forceps passed directly into the abscess cavity and thick, green caseous pus began to well into the operative field (Fig. 262). The pus was aspirated and the cavity thoroughly cleansed by passing a rubber tube attached to an aspirating syringe into its most dependent portion. The wound was dried and the tissues closed in layers.

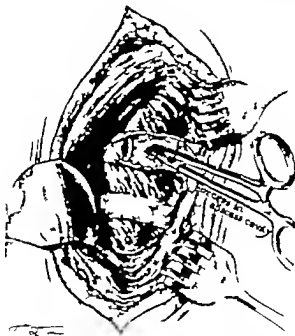


Fig. 262.—Method of draining mediastinal abscess through dorsal approach.

It is evident from these findings that the patient was suffering from the effect of pressure upon the spinal cord produced by a tuberculous abscess. She made an immediate and satisfactory recovery from the operation. The wound healed by primary intention, but the evidences of involvement of the spinal cord disappeared very slowly. The patient was kept in

bed on her back, and left the hospital in a much improved condition.

She returned at the end of six months able to walk, but with a tuberculous empyema of the right pleural cavity. This was drained and treated by repeated irrigations with Dakin's solution and after some months in the hospital was completely healed. The patient returns to us now eight months after her discharge and, as you see she walks perfectly and has no evidence of involvement of the spinal cord. She has gained 15 pounds in weight and informs me that she is now married.

The question of drainage of the posterior mediastinum in tuberculous abscesses is of great importance. It is not commonly done, in all probability not nearly so often as it should be. Jacobs in an excellent contribution on this subject, states that compression paralysis in Pott's disease is not infrequent in adults and occurred in 24 out of 75 patients at the Cook County Hospital between 1914 and 1916. These patients were between nineteen and sixty two years of age. He states that the most frequent cause of such paralysis in adults is intraspinal abscess. At first pressure may not make any appreciable alteration in the nerve elements but sooner or later it is bound to cause severe damage to the cord with a resulting primary or secondary degeneration. At times actual necrosis and severing of the cord may occur. In such cases of course paraplegia will be complete and permanent. As a rule death is anticipated from pulmonary tuberculosis. Recovery may take place occasionally even after paralysis has existed for a long time.

Compression from tuberculous granulation tissue occurs most commonly in children. There is invasion of the vertebral canal and the production of pressure sufficient to excite functional disturbances without actual mechanical destruction of the nerve elements.

Jacobs states that in none of the 24 patients with abscess was operation performed for drainage of the abscess. Of the 24 cases there was not one recovery death or permanent paralysis resulted in every case. These results illustrate the grave consequences of permitting a patient with a tuberculous

abscess developing from the dorsal vertebrae to remain untreated, and it is hoped that the presentation of this patient who was subjected to operation, and who has made an apparently complete recovery may point the way to a safer therapy in this condition.

The method of opening the posterior mediastinum has been discussed by various surgeons. Nusslioid worked out a method of approach upon the cadaver. A flap was made upon one side of the spinal column and a small portion of several ribs resected. The dissected pleura was then pushed aside and the mediastinum exposed.

Quénu and Hartmann did not resect the ribs so near the column as did Nusslioid. The incision was made at the angle of the ribs and by resecting 2 cm. of the third, fourth, and fifth ribs, the hilus of the lung could be exposed and access gained to the esophagus down to the esophageal opening in the diaphragm. They advised performing the operation on the left side because the pleura on the right forms a cul-de-sac behind the posterior wall of the esophagus. This was suggested in spite of the fact that the thoracic esophagus is on the right side. Potarc advised operating upon the right side because the aorta lies on the left side of the spinal column. Enderlen suggested operating on the left when the incision is made above the bifurcation of the bronchi, and on the right when between the bifurcation and the diaphragm. Heldenheim made his incision near the median line, and resected one or more transverse processes together with a section of the ribs. It was his belief that by blunt dissection of the tissues anterior to the vertebrae the pleura would rarely be wounded.

Fontau Menlard's method is similar to that of Heldenheim. He states by following the vertebral bodies after removing two or three laminae and 1 or 2 inches of the adjoining ribs it is easy to dissect away the pleura and have a fairly good view of the structures of the posterior mediastinum.

From the presentation of these 2 patients with abscesses in the posterior mediastinum, one in the upper portion and one in the lower portion, it is evident that if more carefully studied be

given to the diagnosis of these conditions and to early operation, many of the complications incident to such abscesses will be avoided and many lives will be saved that are now lost. That you may make a study of this subject for yourselves I will give you the following references to the literature

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CLINIC OF DR. CHARLES LOUIS MINA

MERCY HOSPITAL

"DUMPING STOMACH" FOLLOWING GASTROJEJUNOSTOMY

Patient Suffering from Severe Gastric Disturbance Following Gastrojejunostomy Fluoroscopic Examination Revealed a "Dumping Stomach." Operation Performed to Unhook Gastrojejunostomy

THE patient, Miss O'R. has long been under my care except for a year and a half during the late war. During most of that time she got along reasonably well, but during my absence she got into rather deep water.

She is now forty years of age. In 1913 she was at Mercy Hospital for a long period under the care of the late Dr. J. B. Murphy and myself. At that time she had an ulcer on the gastric side of the pylorus and was treated for several months. She recovered, increased in weight from 103 or 104 to 130 pounds and was able to act as a housekeeper doing a good deal of work for a number of years. I saw her from time to time when she complained of some gastric ailment or temporary disturbance which always yielded readily to a little treatment and suggestion.

During the war she was again taken with distress and vomiting, and saw a surgeon, who without a ray examination and basing his conclusion wholly upon physical examination, decided that she needed the operation of gastrojejunostomy which he accordingly performed. After my return I did not see her until recently when I was called in consultation.

It now develops that her stomach has been disturbing her very severely for the last year or two. She has been under the care of a physician who was doing the best he could, but that

was little because her needs were great. I found her lying in bed complaining of a great deal of pain, wishing that she might die and threatening to commit suicide if she did not get better vomiting pretty nearly everything that she had eaten. Her weight had fallen to 106 pounds. She was very weak because everything that she ate came up. In fact, her diet had been reduced to milk toast. Even this was vomited more than half the time but it was the only thing that would stay down even in part. I found that she had been living a month on milk toast without any other article of food. I naturally told her that it was absurd to attempt in her home to give her any adequate advice that it could only be done after finding out what her needs were and that these could be determined only in a hospital. She finally assented and, accordingly, came to the hospital the next day.

The Rehfuess examination disclosed a surprise. We gave the customary meal and passed the tube, kept it down four hours, and were unable to aspirate a single drop of fluid in any one of the eight aspirations. The stomach was apparently absolutely dry. This did not coincide with her story of vomiting of food, and it was apparent that the Rehfuess test meal had passed clear through her stomach, and that there were no gastric contents to aspirate. Examination of the feces showed no blood. Examination of the blood showed 70 per cent. hemoglobin, 3,700,000 red cells, and 9000 white cells. She showed on physical examination no tumor mass in the abdomen, no peristaltic unrest, nothing but tenderness in the area midway between the umbilicus and the navel, little to the left.

After the exertion of the Rehfuess test-meal we allowed her to have a quiet afternoon, and the following morning fluoroscoped her and found the reason for the negative Rehfuess findings. As soon as the barium was swallowed it passed from the stomach into the bowel. We could see it slipping into the small intestine almost as fast as it went into the stomach. We gave her in very rapid succession 2 glasses of barium and butter milk, and could hardly get enough lodged in the stomach to make an observation of the pylorus. We could not well fill the

pylorus with manipulation, because as soon as we attempted to squeeze the barium and malted milk toward the pylorus it would shoot into the small intestine. We at once took her into the radiographic room and gave her a third 8-ounce glass of



Fig. 263—Roentgenogram showing the very large dumping bopper following gastrojejunostomy. Notice that the greater curvature is apparently connected with the jejunum far from its beginning. Bear in mind that the barium in the small intestine had taken but five minutes to run in thus extensively.

barium and malted milk, and while she was still drinking it took a skilagram (Fig. 263). This disclosed the diagnosis and the whole story.

The interpretation of her story of the complaint is simple

enough with the present findings. She had had perfect relief from her stomach for about four years, but while I was away she began to have some nausea and vomiting and pain in the epigastrium, coming on mostly at night. She was operated upon in 1918. Since the operation she has had nausea and vomiting followed by pain in the epigastrium and left hypochondrium. The vomitus consists of bile and mucus, or as she calls it, "slime." These attacks always came on about midnight and lasted one-half hour or so and then disappeared. Three weeks ago she had influenza. Three days later she was practically recovered from the influenza when she was seized with severe pain in the left upper abdomen and she vomited. The pain radiated across from right to left and up into the left shoulder. She said that vomiting relieved her a little and that bicarbonate of soda also did some, but there were times when the bicarbonate of soda induced vomiting. For two and half weeks she has been having pain and vomiting almost continuously with remissions only after hypodermic injections, which had unwisely been given to her.

Is it any wonder that the patient has had so much gastric distress when one sees her condition? From the x-ray plate we were unable to determine whether the greater curvature had been fastened to the ileum or not, but we strongly suspected that such might have been the case. She was advised that only one thing could be done—the short circuit would have to be righted. We told her that it would be necessary for the former operation to be undone that she could not have her stomach pumping its contents into some part of the small intestine that it was absolutely essential for her to have the anastomosis unhooked. She assented, and the operation was done by Dr. E. Wyllys Andrews.

It was quite difficult at first to find the point at which the stomach had been fastened to the small intestine because of the adhesions which were present, but it was ultimately discovered, the necessary clamps were applied, and the two organs separated without a great deal of mechanical difficulty. Taking advantage of the opening into the stomach, the pylorus was

explored by Dr. Andrews, who reported that he could easily get his finger through it, so it was thought wise merely to unhook the stomach and permit the pylorus to carry on the work which it should carry on. No other lesions were found in the stomach. The stomach was then closed.

Following the operation and preceding it the patient showed acetone and diacetic acid in the urine the acetone and diacetic acid being due to the preliminary starvation, the etherization and to the subsequent starvation after the unhooking operation. The patient has had a very good convalescence. She was put on the usual treatment of 2000 c.c. daily by proctoclysis given in four doses of 500 c.c. each. The proctoclytic fluid consisted of 5 per cent. glucose and $\frac{1}{2}$ per cent. sodium bicarbonate. The third day she was permitted sips of water and the fourth day she was given fruit juices, strained honey and water by mouth and a little broth, and on the fifth day she was taking broth and gruels freely. It is now five days after the operation and her present condition is excellent.

Nature never intended to have the stomach connected up with the small intestine just any place. There is only one place where an anastomosis can be made without harm to the patient, and that is in the very first portion of the jejunum before the first loop and the anastomosis should not be with the greater curvature of the stomach but should be with the posterior wall. When a posterior gastro-enterostomy is properly performed at this point there is usually no trouble. A vicious circle rarely occurs and the patient's subsequent history is usually excellent. If however the operation is done as it was here the patient is deprived of gastric digestion and of that digestion which takes place in the duodenum and in the beginning of the jejunum. Beyond doubt the jejunum is physiologically important and should not be shut off by the careless operator and furthermore when the stoma is made it should never be much larger than the ordinary pyloric opening. When it is too large the stomach does not retain its contents sufficiently long. Nature evidently wishes the stomach to keep its contents an hour or an hour and a half after an ordinary meal.

If the stomach contents pass out within a short time it is perfectly obvious that something is lost to the patient. This patient is very much in the state that she would have been had the operation of gastrectomy been done. Virtually her stomach was useless to her and in order to put her in perfect physical condition it was necessary to give her stomach back to her. This could only be done by undoing the short circuit which had been made.

We are not necessarily finding fault with the doing of an operation in her case. Her condition indicated that she had an ulcer at the pylorus at some time. That being the case it probably would have been right and proper for the operation of gastrojejunostomy to be performed *if dietetic treatment had failed*. We believe there are only four reasons why a gastrojejunostomy should be done. These are: first, a threatening perforation; second, persistent hemorrhage; third, a narrowed pylorus; fourth, failure to bring about recovery by proper and persistent dietetic treatment. In her case proper and persistent dietetic treatment had not been followed out, and there was no indication for operation. At the present time the pylorus is sufficiently patent to function, and therefore the operation of gastrojejunostomy was wholly unnecessary. We expect her to recover and to have a good stomach ultimately.

Postscript.—These hopes have been fulfilled. April 27, 1922, she is still in hospital, but is up and about partaking freely of light diet with no distress. Her pylorus is functioning perfectly well.

At the date of proof-reading, May 27, 1922, the patient had been out of the hospital almost two weeks in very good health. There is no existing or gastric distress.—C. L. M.

CLINIC OF DR. ALBERT E. HALSTEAD

ST. LUKE'S HOSPITAL

FREE FASCIAL TRANSPLANTS IN DURAPLASTIES

(REPORTED BY DR. FREDERICK CHRISTOPHER)

Use of Free Fascial Transplants to Replace Defects in the Dura. Report of 3 Cases in which this Method was Successfully Used.

CASE I

THIS case is one of traumatic meningeal cyst, or hygroma of dura mater (Virchow) or meningitis serosa circumscripta cystica. Five years previous to admission patient had had a decompression. A swelling started six months after this operation. There was approaching blindness deafness and hernia cerebri. The latter came off of the upper occipital region of the head in a tumor the size of an ordinary toy balloon half inflated. Mass soft and fluctuating 16 inches in circumference was painful to pressure. Patient blind. Optic atrophy probably secondary to optic neuritis, both eyes.

Operation.—An incision was made through the skin over the large tumor and the bleeding controlled by forceps. The dura was then opened and a clear fluid allowed to flow out in small amounts at short intervals. After the fluid was all out the incision in the dura was made larger and the flaps turned over the head. A large opening in the right occipitoparietal region of the skull was found. This was 2 inches wide and about 6 inches deep. This cyst cavity occupied a position between the temporosphenoidal lobe and the parietal bone. The inner (median) wall was formed by the pia covering the temporosphenoidal lobe. The outer wall was formed by the arachnoid and dura. The lining of the cyst presented a glistening white mother-of-pearl appearance. The content was a clear limpid fluid. The

quantity obtained was 7 ounces about one-third of the contents of the cysts was lost. After removing by excision the extra cranial portion of the cyst wall the thin lining membrane was removed from the greater part of the intracranial cyst cavity. This cavity was then filled by a transplant of fat, to which was attached a piece of fascia lata the size of the dural defect (2½ by 3 inches). The fascial transplant was united by interrupted sutures to the edges of the dura surrounding the opening into the cyst. The redundant parts of the scalp were excised. The scalp wound was closed by catgut and silkworm-gut sutures.

CASE II

Patient, H. A. age twenty two was admitted to the surgical service of Dr. Albert E. Halstead, St. Luke's Hospital, Chicago, on September 9 1914. Ten years previous to admission the patient's parents noticed a small hard lump the size of a pea in the right upper temporal region. No known injury to this area. The mass continued to grow was always tender. Eighteen months previous to admission an operation was performed, at which the mother said a small piece of loose bone was removed. It was learned that at this time a section of the skull was curetted on the supposition that there was an osteomyelitis present. The mother says that she has noticed no cerebral symptoms, but the patient had always been subject to headaches. Physical examination, aside from the tumor negative. Operation, September 22 1914. Dr. Albert E. Halstead. The head was prepared with iodine and a constrictor applied to the scalp. A horseshoe-shaped incision was made over the protruding portion of the skull. The flap of scalp was turned back exposing the bony tumor. A circular incision was made through the pericranium widely surrounding the tumor. The pericranium was tripped back, exposing the bone. A circle of small holes was made with the Hudson set and these connected with a Gigli saw (Fig. 264-1). This portion of the skull which included the bony new growth was now loosened and lifted up. It was found to be adherent to the dura because of processes which had grown out through the diploë and it was necessary to remove the underlying section

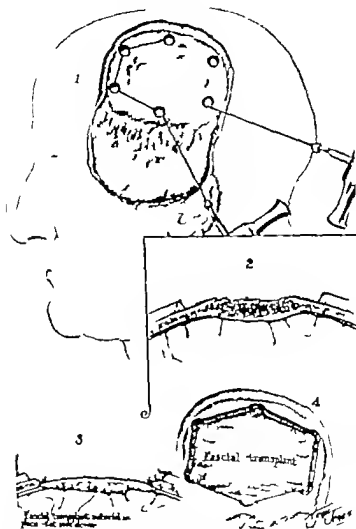


Fig. 264.—1 Method of removing area of skull affected by osteosarcoma. 2, Cross-sectional view of osteosarcoma of the skull, showing the dura to be intimately adherent to the osteosarcoma. 3, Cross-sectional view showing fascia lata fastened in place with the fat side down, to take the place of the dura removed in resection of tumor. 4 Fascial transplant in place.

quantity obtained was 7 ounces about one third of the contents of the cysts was lost. After removing by excision the extracranial portion of the cyst wall the thin lining membrane was removed from the greater part of the intracranial cyst cavity. This cavity was then filled by a transplant of fat to which was attached a piece of fascia lata the size of the dural defect (2½ by 3 inches). The fascial transplant was united by interrupted sutures to the edges of the dura surrounding the opening into the cyst. The redundant parts of the scalp were excised. The scalp wound was closed by catgut and silkworm-gut sutures.

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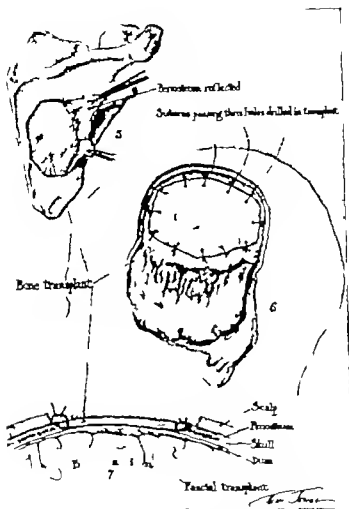


Fig. 265—5, Diagram showing method of removing the hexagonal bone transplant after reflection of the pericranium. 6, Hexagonal bone transplant fastened into the defect in the skull. 7, Cross-sectional view showing the method of attaching bone transplant. The transplant rests on base formed by the inner table of the skull.

of several nodules in the scalp at the site of the previous operation and also because of pain in the old scar. On January 22

of the dura with the bone tumor (Fig. 264, 2). Accordingly a wide circular incision was made in the dura and the whole affected portion removed. There was a marked depression in the brain beneath the tumor. A semicircular incision was made in the thigh and a portion of the fascia lata with adherent fat was dissected off. This was transferred to the defect in the dura so that the fat side was down and sutured there by interrupted sutures of fine chromic catgut (Figs. 364, 3, 4). The scalp flap was sutured with interrupted silkworm-gut. The wound was covered with compound tincture of benzoin, silver leaf, and a dry dressing.

The histologic diagnosis of the specimen removed at operation was osteosarcoma of the skull (Dr. E. R. LeCount).

The patient made an uneventful convalescence and was discharged thirteen days after the operation.

On January 25, 1915 the patient was readmitted to the service of Dr. Halstead.

Operation January 26, 1915 Dr. Halstead. The defect of the skull incurred in the preceding operation was exposed, and the fascia lata which had been transplanted in the previous operation was readily identified and found to be in good condition. A hernia cerebri. A piece of bone about 3.75 by 5 cm. was removed from the body of the scapula (Fig. 265, 5) and trimmed to fit the defect in the skull and a number of small holes were drilled through it to the borders. Chromic sutures were passed through these holes and tied to the adjacent periosteum of the skull (Figs. 265, 6, 7). Temporal muscle was sutured over the transplant, and the wound closed and dressed in the usual manner.

The patient made an uneventful convalescence and was discharged twenty days after the operation.

On September 2, 1915 the patient was readmitted complaining of pain in the old scar. Under local anesthesia nerve which had been caught in the scar of the old incision was removed and the patient was discharged the same day. On September 23, 1915 further scar tissue was removed. On January 20, 1916 the patient was again admitted to the hospital because

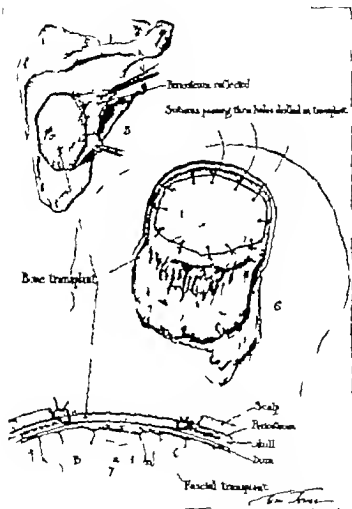


Fig. 265—5 Diagram showing method of removing the hexagonal bone transplant after reflection of the periosteum. 6, Hexagonal bone transplant sutured into the defect in the skull. 7 Cross-sectional view showing the method of attaching bone transplant. The transplant rests on base formed by the inner table of the skull.

of several nodules in the scalp at the site of the previous operation and also because of pain in the old scar. On January 22

1916 the scar tissue was excised together with a piece of bone for histologic examination. There was no recurrence. The wound was closed in the usual manner and there has been no recurrence.

The patient was an officer in the army during the war and was present in some of the most severe actions. At present he holds the rank of captain in the regular army.

CASE III

On June 11 1916 the patient Mrs. F. G. (St. Luke's Hospital, Chicago Illinois, No. 153,654) was in an old-fashioned swing fastened with large logging chains to the limb of an oak, the limb being about 30 feet from the ground. The chain broke and struck her on the right side of the head about 4 inches above the eye. After the injury the patient walked into the house and up the steps, but gradually lapsed into unconsciousness. She was brought to the nearby city of New Orleans four hours later in profound unconsciousness and breathing from six to eight times a minute.

The surgeon here lifted the scalp and found a comminuted fracture of the skull. The dura was torn and at least a teaspoonful of brain tissue escaped. There was a marked depression and a piece of bone larger than a dollar was removed. She had an uneventful recovery and was perfectly well for five years.

In April, 1921 or seven months previous to her admission to St. Luke's Hospital the patient had a severe convulsion. She has had three other convulsions since that time the last one two weeks prior to admission.

The attacks or convulsions were usually preceded by a feeling of depression. The eyes would begin to twitch and turn upward. Her mouth was drawn to one side. Her hands would become claw-like and her legs be flexed. The entire body would become rigid she would froth at the mouth and vomit profusely and bite her tongue and lips. She would not fall during the attacks which lasted about fifteen minutes, but would sit up straight and rigid. She is confused for several hours after each attack.

On examination there was noted healed depression of the upper medial angle of the right frontal bone in the sagitto-

coronal angle near the coronal suture and depressed about 1 cm. is a triangular area nearer the midline and less in the wing extending to the right. The entire defect is 8.5 cm. side to side and the triangular depression is 3.5 cm. wide. The brain



Fig. 266.—Roentgenogram (Case III) taken at time of operation. There is a large area of decreased radiability involving the right parietal and frontal bones of the skull. This area measures about 3 inches in its longest diameter and the posterior border is somewhat depressed.

pulsates in one portion of this defect. Triceps abdominal, and patellar reflexes present. Pupil reactions, tension, ocular muscle excursions, and fundi are all normal. Refraction shows a high degree of hyperopia. Physical examination otherwise negative.

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CASE III

On June 11 1916 the patient, Mrs. F. G. (St. Luke's Hospital Chicago Illinois No. 153 634) was in an old-fashioned swing fastened with large logging chains to the limb of an oak, the limb being about 30 feet from the ground. The chain broke and struck her on the right side of the head about 4 inches above the eye. After the injury the patient walked into the house and up the steps but gradually lapsed into unconsciousness. She was brought to the nearby city of New Orleans four hours later in profound unconsciousness and breathing from six to eight times a minute.

The surgeon here lifted the scalp and found comminuted fracture of the skull. The dura was torn and at least teaspoonful of brain tissue escaped. There was a marked depression and a piece of bone larger than a dollar was removed. She had an uneventful recovery and was perfectly well for five years.

In April, 1921 or seven months previous to her admission to St. Luke Hospital, the patient had a severe convulsion. She has had three other convulsions since that time, the last one two weeks prior to admission.

The attacks or convulsions were usually preceded by feeling of depression. The eyes would begin to twitch and turn upward. Her mouth was drawn to one side. Her hands would become claw-like and her legs be flexed. The entire body would become rigid she would froth at the mouth and vomit profusely and bite her tongue and lips. She would not fall during the attacks, which lasted about fifteen minutes, but would sit up straight and rigid. She is confused for several hours after each attack.

On examination there was noted healed depression of the upper medial angle of the right frontal bone, in the sagitto-

During the operation the systolic blood-pressure rose to 141 and at the end was 131. The general condition was good. After a very easy convalescence the patient was discharged on January 8, 1922, twenty-three days after the operation. There has been no return of the former symptoms save a few slight dizzy spells which the patient had while she was still in the hospital.

Discussion.—Ablation of a section of the dura may be occasioned by trauma or it may have become necessary in the operative procedures incident to the removal of tumors of the skull or the brain. Absence of a portion of dura, particularly if there be no effort to make an overlying bone-graft, is almost invariably followed by hernia cerebri because of intracranial tension which is pulsating in nature.

The subject of replacing these defects in the dura has been given a great deal of study. The ideal transplant material must be made from (1) a tough tendinous tissue and (2) a tissue which is clothed in an endothelial layer. Only by this means can a large defect of the skull be covered water-tight, the strong mechanical resistance be overcome and transplant not grow to the brain surface. Fascia and periosteum are materials possessing the first attribute and skin and periosteum the second. The periosteum almost invariably becomes adherent to the pia mater and hence has been found unsuitable. The skin must be rejected because of the difficulty or impossibility of rendering it sterile and because of its too great elasticity. Peritoneum has not been found to be practicable because the endothelial layer is damaged or changed in the process of transplantation.

Free transplants of fat have been tried in the hope that after the fat has contracted a suitable layer will remain, but the inability to secure a firm water-tight union virtually excludes the use of fat alone.

By far the best material to be used in duraplasty is the fascia lata of the same individual (Fig. 267). This was first employed in 1910 by Körte. The advantages of fascia are (1) firmness (2) resemblance to the histologic structure of the dura (3) accessibility (4) possibility of obtaining aseptically

The Roentgen findings (Fig. 266) (Dr. E. L. Jenkinson) were as follows: There is a large area involving the right parietal and frontal bones of the skull of an increased radiability. This area is due to the absence of bone. The area measures about 3 inches in its longest diameter. The posterior border of this area is somewhat depressed. There is no evidence of loose bone. The base of the skull seems normal. The clinoid processes are normal in outline. The floor of the sella is regular in outline. There is no evidence of increased intracranial pressure.

White count (December 27, 1921) 8800. Urine negative.

Operation (Dr. Albert E. Halstead, December 16, 1921).—Nitrous oxide and oxygen anesthesia. The scalp had previously been shaved and washed with neutral soap, Dakin's solution, alcohol and powdered with dry boric acid. At time of operation the dry boric acid was washed away with ether and painted with iodine. Loose-meshed gauze and rubber constrictors were then applied to the scalp. A curved scalp incision 12 cm. long was made and the scalp flap was carefully dissected from the periosteum and turned outward. The fibrous adhesions between the leptomeninges and the scalp and the parietal and visceral arachnoid and the margin of the defect were dissected free. A sponge saturated with hot salt solution was used to control bleeding.

The right thigh was then prepared and a piece of fascia lata and fat 1 cm. thick and about 6 cm. in diameter was removed. It was immediately placed in warm salt solution and carried to the head where it was transferred to the defect in the skull so that the fat pad was in contact with the cerebrum. The fascia was sewed to the edge of the dura and periosteum, the edges of the skull defect having been freshened with a chisel, and the thick ridge of bone which was posterior having been chiseled away.

Small pieces of bone with periosteum intact were then chiseled loose in front of the defect, and they and other small pieces cut away from the edge of the defect were laid over the fascia. The periosteum was sewed with catgut and the scalp stitched with silkworm tension sutures. Silver foil and gauze saturated with compound tincture of benzoin were applied to the wound.

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(5) Its nutrition is readily maintained under unfavorable circumstances. The small amount of endothelial coating of fascia has been cited as a disadvantage. To overcome this defect recent workers (Lukes Wendel, Payr) have left a portion of the subcutaneous fat attached to the fascia lata and have so inserted the fascial transplant that the fat side is toward the brain.

Lawrow collected 73 cases in which fascia was used in duroplasties and in all but 2 cases a water tight union was secured. There was a large number of cures not only in fresh injuries to the dura but also in covering operative defects, and in individual cases the results were astonishing.

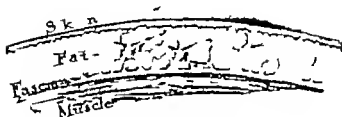


Fig. 267 —Cross-section of superficial tissues of the thigh showing fascia lata with overlying adherent fat

The fascia lata transplants with their attached fat must be larger than the defects which they are to cover. Where possible they must be inserted by pushing their edges under the bone edges, and be closely approximated to the good circumjacent dura with fine sutures. Silk has been recommended for this purpose.

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CLINIC OF DR. DAVID C STRAUS

COOK COUNTY HOSPITAL

RECENT GUNSHOT WOUNDS OF THE KIDNEY; WITH REPORT OF 4 CASES

Case I. Through and-through Gunshot Wound of Left

Penetration of Left
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COOK COUNTY HOSPITAL

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Case I. Through-and-through Gunshot Wound of Left Chest, Diaphragm, and Abdomen, with Penetration of Left Lobe of Liver Anterior and Posterior Wall of Stomach Pancreas, and Left Kidney Operation and Recovery

Case II. Through-and-through Gunshot Wound of Left Side of Abdomen, with Bullet Lodged Just Beneath the Skin Just to the Left of the Spine at About the Level of the First Lumbar Vertebra. Nephrectomy and Recovery

Case III. Three Through-and-through Gunshot Wounds All from Behind Forward One Entered Just Beneath the Left Eleventh Rib Passed Through the Abdomen, Diaphragm, and Lower Left Chest, with the Wound of Exit in the Eighth Inter costal Space in the Nipple Line A Second Entered Just to the Left of the Vertebral Column, Nicked the Fourth Lumbar Vertebra, Passed Through the Abdomen, and Lodged Beneath the Skin of the Anterior Abdominal Wall Just Below the Level of the Umbilicus and Just Outside the Nipple Line A Third Entered the Left Buttock and Escaped Just Below the Middle of Poupart's Ligament on the Left Side.

Case IV Through-and-through Gunshot Wound of Abdomen with Bullet Wound of Entrance the Size of a .38-caliber Bullet, Located About 1 cm. to the Left of the Midline at the Level of the Tip of the Xiphoid Cartilage, and a Similar Bullet Wound of Exit Located About Two Fingerbreadths Below the Right Twelfth Rib and at a Point About 3 Inches to the Right of the Spine with Perforation of the Liver and the Right Kidney Uneventful Recovery Without Operation.

Discussion of the Symptoms, Surgical Indications, and Operative Technic of Recent Gunshot Wounds of the Kidney

These cases were presented before the Clinical Meeting of the Chicago Surgical Society held Friday April 7 1922.

SINCE the close of the war gunshot wounds have been very frequent, probably due to the unsettled social conditions. Since my return to civil practice I have handled a considerable number of gunshot wounds at the Cook County and Michael Reese Hospitals, and among these I have had 4 cases where the bullet penetrated the kidney. I wish to present these 4 cases and to discuss the symptoms, surgical indications, and operative technic of handling recent gunshot wounds of the kidney.

CASE I

H. F., Cook County Hospital, No. 746448 a teamster thirty four years of age attempted to commit suicide while in bed at 7:15 A. M. December 20, 1920 by discharging a revolver into the region of the heart. He was brought to the Cook County Hospital by the police at 8:05 A. M.

When admitted he was conscious and in reply to questioning stated that bleeding had not been profuse, that no blood had been expectorated and that he had not vomited. He complained of some pain on deep inspiration in the lower left side of the chest. His greatest complaint was pain and tenderness in the upper left quadrant of the abdomen. The history is otherwise of no particular significance.

Physical examination, recorded by the intern soon after the patient was admitted, showed the following findings. The patient was a well-nourished white male, thirty four years of age, who was apparently suffering with considerable abdominal pain. Temperature was 97.6° F. pulse 68 and respirations 20. Examination of the head showed no abnormal findings. The lips were of good color.

Neck—There was a light cervical tenderness. No subcutaneous emphysema was present.

Chest—There was a .32-caliber bullet wound of entrance in the seventh left intercostal space just within the left midclavicular line (Fig. 268). The skin showed powder burns and a zone of subcutaneous emphysema about the wound. A slit-like wound of exit was located in the left scapular line just below the twelfth rib (Fig. 269).

Lungs—The right lung showed no changes in fremitus, resonance, or breath sounds. The left lung showed no changes in the upper part, but there was hyperresonance from the fifth to the seventh intercostal space and dulness below the seventh



Fig. 268.—Photograph of patient (Case 1) taken after stitches had been removed, but while the wound was still draining. This shows the bullet wound of entrance in the seventh left intercostal space just within the left mid-clavicular line. Note the powder burns about it and the blister slightly lateral to and above it. The line of incision is plainly visible. This begins just below the tip of the xiphoid process, continues downward, parallel to and slightly below the left costal arch, until the middle of the left rectus muscle is reached, when it curves downward, following the direction of the left rectus muscle, and terminates slightly below the level of the umbilicus. At about the center of the upper concave portion of the incision the opening left for drainage can be clearly seen.

Breath sounds below the seventh interspace were distant and tactile and vocal fremitus decreased.

Heart—The borders were within normal limits. No murmurs were heard. The pulse was 68 regular but weak.

Abdomen —There was marked tenderness in the epigastrium and beneath the left costal margin. The whole abdomen was rigid, but the rigidity was most marked in the left upper quadrant. Percussion showed that the lower margin of the liver extended about $1\frac{1}{2}$ inches below the right costal arch. The liver could not be palpated owing to the rigidity of the abdomen.

Extremities were normal. Pupillary patellar triceps, Achilles abdominal and cremasteric reflexes were normal.



Fig. 269 —Photograph of patient (Case I) taken at the same time as Fig. 268, showing slit-like bullet wound of back located in the left scapular line just below the fifth rib.

The blood-pressure was 118 systolic and 82 diastolic. Pulse-pressure was 36.

A specimen of urine was collected and examined, and showed specific gravity 1030 albumin present in large amount (2 mm ring) sugar absent. Microscopic examination showed the presence of many red blood-corpuscles, but no casts.

When I first saw the patient at 11 A. M. I dictated the fol-

lowing findings: "The patient lies quietly and does not appear to be in shock. His color is good. He complains of pain located just above the umbilicus. He has no pain in the chest except on deep inspiration, which causes pain in the lower portion of the left side of the chest. Otherwise respirations seem normal—20 per minute.

"*Head* shows nothing of particular interest. The lips are of good color. The tongue is clean.

Neck—There is some slight bilateral cervical adenopathy. Pulsation of the jugular is visible and palpable. There is no subcutaneous emphysema.

Chest—Lungs Right lung is entirely normal on palpation, percussion, and auscultation. Percussion of the upper anterior part of the left chest gives a normal note until the anterior axillary border is reached, where the note becomes more tympanic than normal—pneumothorax. In the axilla this tympanic note extends as low as the seventh rib below which the percussion note is dull. Auscultation over the hyperresonant area in the axilla shows distant breath sounds. Below the seventh rib the breath sounds are very distant or absent—fluid probably blood.

Chest Wall—In the seventh interspace just within the nipple line there is a bullet wound of entrance. About this wound is some slight subcutaneous emphysema. Examination of the chest posteriorly shows nothing abnormal on the right side. On the left side hyperresonance is present as low as the eighth rib below which there is dullness. There is a bullet wound of exit just within the scapular line at about the level of the twelfth rib. Auscultation over the right side of the chest shows normal findings. Over the left side breath sounds are somewhat decreased as low as the eighth rib below which they are nearly absent. Tactile fremitus is markedly decreased in this latter area.

Abdomen—The abdomen is somewhat scaphoid and there is general rigidity especially in the upper half. Palpation shows a tender area just above the umbilicus. The liver dullness is not obliterated. Percussion shows that the liver extends about one

and a half fingerbreadths below the right costal arch, but, due to rigidity palpation is difficult and, therefore unreliable.

Blood examination made at this time showed hemoglobin 80 per cent. and leukocyte count 19,800

Diagnosis.—From these findings I made a diagnosis of gunshot wound of the left chest and abdomen, with probable perforation of the left lower lobe of the lung with moderate pneumothorax and moderate hemothorax perforation of the diaphragm, perforation of the stomach, left kidney and possible perforation of the spleen and some portion of the intestine.

As soon as I completed my examination the patient was given a hypodermic injection of morphin, gr $\frac{1}{2}$ with atropin gr $\frac{1}{16}$, and arrangements were made for immediate operation.

Operation.—As the chest condition seemed of much less seriousness than that of the abdomen, there merely being a moderate pneumothorax in the left chest and a moderate hemothorax, with no displacement of the heart to the right and no dyspnea, I deemed it wiser to not do any intrathoracic operation to repair the damage in the left chest and close the perforation in the diaphragm from above or do a transthoracic laparotomy but, instead, to first open the abdomen.

Under ether anesthesia an 8-shaped incision was made on the left side beginning above just beneath the costal cartilage and curving the incision downward and laterally until the middle of the left rectus muscle was reached, and then continuing it vertically downward almost to the umbilicus, when it again was curved downward and outward to the left to slightly below the level of the umbilicus (Fig. 268). The skin and anterior sheath of the rectus were divided the internal half of the left rectus muscle was completely divided, and the two cut ends grasped and held by heavy double chromic catgut stitch so as to later close the ends and to prevent the cut ends from retracting within the sheath. Then the rectus muscle was divided the length of the incision by blunt dissection, care being taken not to divide the nerves supplying it. These were exposed but not injured. The outer half of the left rectus muscle was retracted laterally and then the posterior sheath of the rectus and the peritoneum were

divided the entire length of the incision by means of scissors. Before the peritoneum was divided blood free in the peritoneal cavity was plainly seen through the parietal peritoneum. On opening the peritoneal cavity a fair amount of free blood escaped. The transverse colon presented and blood could be seen through the transverse mesocolon in the lesser peritoneal cavity. The transverse colon was inspected but no perforation found in it. The anterior wall of the stomach was examined systematically beginning at the cardia and proceeding toward the pylorus. A .32-caliber bullet size perforation was almost at once found on the anterior wall of the stomach at about the junction of the cardiac with the middle third, and about 3 cm. from the lesser curvature. No escaped gastric contents was seen and only a slight amount of leakage occurred during the examination. The stomach was quite distended and contained brownish fluid in considerable amount—partly blood. There was no bleeding to speak of from this perforation. It was at once closed by means of four through-and-through sutures of black waxed silk, placed at right angles to the long axis of the stomach to prevent narrowing and then by a second row of continuous Lembert stitches of the same material, the second row extending well beyond the first at both ends. Next the duodenum was examined and found intact. Before examining the posterior wall of the stomach the descending colon and spleen were examined. Both were entirely normal. The spleen when drawn forward was seen to be of normal size with a normal surface. There was no bleeding. The left kidney pouch was then exposed, but no retroperitoneal collection of blood could be made out. Finally the left half of the diaphragm was examined and a perforation through it was well exposed. This was located at about the middle portion of the anterior half and rather near the anterior margin. It was sutured with chromic catgut without much difficulty and a satisfactory closure accomplished. Now the few neighboring coils of small gut in the field were examined, but all were normal. After sponging away the remaining blood in the general peritoneal cavity the lesser peritoneal cavity was seen to be full of blood. An opening was made into the lesser sac by incising the gastro-

colic omentum transversely after first doubly ligating the vessels it was necessary to cut. An opening of at least 5 inches was made, and then the blood in the lesser peritoneal cavity was sponged away. The posterior wall of the stomach was examined, and a perforation, similar to the one that had been closed in the anterior wall, was seen at about the middle of the posterior wall, at a point about midway between the greater and lesser curvatures. This perforation was leaking a moderate amount of air and blood. It was closed in the same manner as the one in the anterior wall, great care being taken to assure a water tight closure. Next the pancreas was examined. It looked and felt normal except for a point at about its middle, where it evidently had been perforated. Here there was some escaped blood in the form of a small hematoma, but as there was no active bleeding no interference was done. There was no fat necrosis anywhere. As there was no active bleeding in the lesser peritoneal cavity and no soiling with stomach contents, the opening made on the gastocolic omentum was closed without drainage, using a running plain catgut suture.

The liver was next examined. It was considerably enlarged. There was a through-and-through bullet wound in the left portion of the left lobe at a point about 3 cm. from the lower margin and at about the same distance from the left tip. Both the wound of entrance on the anterior surface and the one of exit on the inferior surface were stellate and irregular but there was no active bleeding and so no suturing was done.

Finally a cigarette drain was placed between the inferior surface of the liver and the anterior wall of the stomach and then the abdomen was closed in layers above and below the drain. The posterior rectus sheath was closed together with the peritoneum using continuous chromic catgut suture. Next the divided inner portion of the rectus muscle was sutured together by tying the two mattress sutures which were inserted before the muscle was cut reinforcing this by a row of continuous chromic catgut sutures. The two nerves of the rectus which had been exposed were still intact. Next the anterior rectus sheath was closed in the same manner as the posterior sheath.

A few stitches were put in to hold the divided portion of the external and internal oblique where they had been divided. Next a number of interrupted tension sutures of silk were inserted but not tied until after the skin had been closed by a running black waxed silk suture. The patient left the table in good condition.

Postoperative Course—Patient's condition following operation was very satisfactory. The drain was removed December 23d—the fourth day after the operation. All stitches were removed on December 27th. Drainage was very slight following operation, not enough to make a satisfactory bile test, which was attempted. Urine was examined for bile but none found. Recovery was uneventful. The temperature never went above 100.2° F and this only a few times, usually remaining under 100° F. The pulse likewise remained low after the second day ranging between 72 and 90. Respirations were 18 to 22. The patient was discharged cured January 3 1921 fourteen days after the accident.

CASE II

E. S. Cook County Hospital No 760 763 a laborer forty seven years of age, was brought into the hospital by the police at 2.05 P. M. May 16 1921.

Upon questioning the patient stated that he was drunk at the time he was shot and did not know anything about the circumstances of the shooting. From the police it was learned that the patient had been shot at 4 o'clock in the morning and was brought to the University Hospital in an intoxicated condition. Here his wounds were dressed and the patient advised to undergo an exploratory operation, which both he and his brother refused. The physician who cared for the patient informed us that at this time his temperature was 98° F pulse 108 and respirations 20. At 1.30 P. M. they had catheterized the patient removing 22 ounces of very bloody urine the first ounce appearing to be almost pure blood.

Physical examination upon entrance showed the patient to be a thoroughly well-nourished white male about forty-seven years of age who was brought into the hospital because of a

gunshot wound in the left side of the abdomen. His pulse was 130 but of good volume temperature 99.6° F and respirations 24. Examination of the head, neck, and chest showed no findings of interest. The essential pathology was limited to the abdo-



Fig. 270.—Photograph of patient (Case II) taken after the stitches had been removed and the patient was up and about. Note how the kidney incision was carried forward to just below the bullet wound of entrance so as to expose the peritoneal cavity from in front, so that the descending colon and its mesentery could be examined. In order to gain adequate exposure of the other abdominal viscera a second incision was made beginning near the anterior extremity of the oblique incision, extending upward and medially just to the medial side of the bullet wound of entrance (*A*) carrying the incision upward parallel to the costal arch to the medial side of the left rectus muscle, which was completely divided. Note the area in the kidney incision where drainage had been introduced (*D*).

men. There was a gunshot wound of entrance the size of a .38-caliber bullet, in the left side of the abdomen about a hand-breadth below the costal arch and just outside the nipple line (Fig. 270 *A*). There was some slight subcutaneous emphysema



Fig. 271.—Photograph of patient (Case II) taken after the stitches had been removed and here the patient is up and about. Note the small vertical incision just to the left of the spine at about the level of the first lumbar vertebra, through which the bullet which lodged just beneath the skin was removed. The mark left by the suture used to close this incision is seen crossing this at about its middle. Note also the lateral incision used to expose the kidney. You will see that this does not begin as near the median line or as high up as the usual oblique incision used to expose the kidney. This is an adequate incision for muscle-splitting exposure of the kidney.

about it. The bullet could be palpated beneath the skin just to the left of the spine at about the level of the junction of the first and second lumbar vertebrae. The course therefore was from before backward and slightly medialward.

The abdomen was not rigid but there was tenderness over the wound of entrance and also over the point of lodgment. There was definite dullness in the left flank which shifted but slightly on change of position. *There was almost complete obliteration of the liver dullness anteriorly.* The liver, spleen, and kidneys were not palpable. Examination was otherwise negative. Blood examination showed 4,800,000 red cells and leukocyte count 10,200.

Diagnosis.—As the bullet had entered through the left side of the abdominal wall about a handbreadth below the costal arch and just lateral to the nipple line and as the bullet could be felt posteriorly just to the left of the spine at about the level of the junction of the first and second lumbar vertebrae, and as the urine contained an enormous amount of blood, it was clear that the left kidney had been perforated. From the course the bullet had taken it seemed likely that there might be perforation of the stomach, descending colon, and small intestine but as fourteen hours had elapsed since the accident and as there was dullness in the left flank, with no evidence of peritonitis (no abdominal rigidity or pain and a leukocyte count of only 10,200) I believed the free fluid was blood rather than escaped gastric or intestinal contents.

Immediate operation was arranged for and the patient was given morphin gr $\frac{1}{4}$ with atropin gr $\frac{1}{16}$ hypodermically.

Operation.—In deciding whether to primarily expose the kidney through a posterior incision or first do a primary exploratory laparotomy the following points were taken into consideration. From the progressive rapidity of the patient's pulse which had risen to 130 just before the operation and from the fact that the urine contained so large an amount of blood it seemed probable that the patient was suffering from severe hemorrhage from the kidney. The amount of blood in the abdomen, so far as one could estimate it from the amount of dullness

in the left flank, even if one believed it was entirely or largely blood seemed insufficient to explain the rapidity of the pulse. Furthermore as it seemed almost certain that I would have to expose the kidney and as it seemed probable that there might be a perforation of some hollow viscus in the abdomen, I deemed it safest to expose the kidney primarily so as to avoid the risk of carrying any infection from the abdomen into the retro-peritoneal space. Accordingly arrangements were made for a kidney operation and the patient was placed in the usual position on his right side. Before exposing the kidney the bullet was removed through a separate small incision. After removing the bullet this wound was swabbed out with tincture of iodine and closed with a single silk-worm-gut suture (Fig. 271).

The kidney was now exposed by a transverse essentially muscle-splitting incision (Fig. 271). This was not begun nearly as far posteriorly or as high up as the usual kidney incision for I planned to carry the incision forward after completing the kidney operation in order to do an exploratory laparotomy. The original incision ended anteriorly in the region of the posterior axillary line. After dividing the skin and subcutaneous tissues the muscles were separated much as one does in a muscle splitting appendectomy operation, in an endeavor to expose the kidney in a purely muscle-splitting manner. It was soon apparent that there was a great deal of hemorrhage about the kidney. Consequently in order to expose the kidney as quickly as possible, the operation was not carried out further as a muscle-splitting one. On touching the perirenal tissues an enormous amount of blood escaped and severe active bleeding continued. The capsule of the kidney was stripped off by the blood. The renal pedicle was quickly exposed and a large curved clamp placed about it. This controlled the hemorrhage. The kidney was now examined to determine the extent of the injury to it and whether or not it was necessary to perform a nephrectomy. There was a large irregular defect in the kidney at the pelvis near its lower portion posteriorly (Fig. 272) and this infringed upon the pelvis (Fig. 273). Because of the size of the defect and the extent of the damage to the pelvis nephrectomy seemed im-

perative. This defect was the wound of exit of the bullet after having traversed the lower pole of the kidney. There was a large amount of hemorrhage in the kidney tissue about this defect (Fig. 272). The wound of entrance was seen at the



Fig. 272.—Photograph of kidney removed at operation (Case II). Note that the kidney is devoid of its true capsule, i. e., that subcapsular nephrectomy was performed. On exposing the kidney the capsule of the kidney was found stripped off and there was a large amount of blood between the cortex of the kidney and the capsule. Note the large defect in the posterior surface of the kidney near the lower pole and the extensive damage about it with hemorrhage into the adjacent renal tissue. Note that the defect extends into the pelvis. This can be better seen in Fig. 273. The kidney presented an irregular surface due to old pathologic change—a secondarily contracted kidney.

anterior lateral portion of the lower pole of the kidney and was of the size of a .38-caliber bullet (Fig. 274).

Nephrectomy was now quickly performed. The ureter was doubly clamped and divided. (The value of first dividing the ureter before attacking the renal vessels in case of nephrectomy was emphasized in a recent clinic in which the technic of

subcapsular nephrectomy was described and illustrated in detail.

Having done this, the renal artery and vein were doubly ligated distal to the clamp with No 2 chromic catgut and then the kidney was cut away subcapsularly. The clamp was now re-



Fig. 273.—Photograph of kidney (Case II) removed at operation, looking directly at its medial surface. This shows that the kidney was removed subcapsularly. Note that the large defect on the posterior surface of the kidney near the lower pole, caused by the bullet wound of exit, extends laterally and involves the pelvis and hilum.

moved and all bleeding was seen to be controlled. After ligating the ureter a small rubber drainage tube was inserted and the incision was closed in layers up to the drain (Fig 270 D) using No 2 chromic catgut for the muscles and black waxed silk for the skin.

Then the incision was carried forward and downward to just below the bullet wound of entrance (Fig 270). On opening the peritoneal cavity a considerable amount of blood escaped. The mesentery of the descending colon was seen to contain a considerable amount of blood between its two layers. In order to gain adequate exposure a second incision was made from near the anterior extremity of the oblique incision upward and



Fig. 274.—Photograph of kidney (Case II) removed at operation, viewed from its anterior surface. Note the bullet wound of entrance at the antero-lateral portion of the lower pole. The dark area surrounding it shows the extent of the hemorrhage about the wound of entrance. The .38 caliber bullet is seen lying just lateral to the lower pole of the kidney.

medially just to the medial side of the bullet wound of entrance carrying the incision upward parallel to the costal arch to the medial side of the rectus muscle which was completely divided (Fig 270). A mattress suture of chromic catgut was passed through each of the two cut ends of the rectus muscle together with its anterior and posterior sheath, so as to prevent the ends retracting within the sheath. Now the abdomen was refully and systematically explored—first the descending and transverse

colon with its mesentery then the stomach the liver and finally the entire small intestine beginning at the ileocecal valve and progressing upward until the ligament of Trietz was reached. No perforation of any viscus was found. After swabbing away the free blood the mesenteries were examined but no active bleeding was found. There was a perforation through the mesentery of the descending colon, but as no active bleeding was noted it was left untreated. The spleen was palpated, but not seen, no perforation could be made out, although there were some clots in its vicinity. The abdomen was closed without drainage using No. 2 chromic catgut for the peritoneum and muscle layers and black waxed silk for the skin. Several interrupted tension sutures of heavy black waxed silk were inserted.

During the operation the patient was given 1000 c.c. of normal saline solution beneath the breasts.

The patient's pulse immediately before the operation was begun was 130 and only of fair quality. After the operation the patient's condition was very fair and his pulse had fallen to 120 and was of good quality.

Postoperative Course—The patient's pulse progressively improved until by midnight it had come down to 108. By the second day it came down from 100 in the morning to 84 in the afternoon. The patient made an uneventful recovery and was discharged from the hospital June 10, 1921, cured, twenty-five days after the accident.

CASE III

L. F. Michael Reese Hospital No. 18,840, a negro, twenty-two years of age, was brought into the hospital by the police at 4 A. M. June 23, 1921. The patient was robbing a pool room; the police entered and the patient in attempting to get away jumped through a glass door. A policeman shot at the patient as he was running away, shooting him twice through the abdomen and once in the left buttock. This was at about 2 A. M.

Physical Examination.—The patient lay quietly in bed but was slightly restless, seemed very uncomfortable and was moaning. He was conscious and clear mentally. He was not in

abock. He had not vomited. The pulse was of good quality—60. The respirations were quiet. Temperature was 99° F rectally.

There were two through-and-through gunshot wounds of the abdomen, both from behind forward and both through the left side of the abdomen. One entered the eleventh intercostal space



Fig. 275.—Photograph of patient (Case III) taken after all sutures had been removed and the patient was up and about. The three bullet wounds of entrance can clearly be made out. The upper one (1) perforated the twelfth rib, as can be plainly seen in the roentgenogram (Fig. 277). The middle one (2) is seen immediately adjacent to the vertebral column, about 1 inch below line joining the iliac crests, that is, at point corresponding to the transverse process of the fourth lumbar vertebra. The lower one (3) is seen in the left buttock.

about 5 cm. to the left of the median line (Fig. 275-1). A corresponding wound of exit (Fig. 276-1) was located just above the costal arch anteriorly at point midway between the left nipple line and the midclavicular line just lateral to a line joining the umbilicus and the left nipple. This, also, was about the size of a .38-caliber bullet.

There was a second bullet wound of entrance (Fig 275 2) immediately adjacent to the vertebral column, about 1 inch below a line joining the iliac crests, that is at a point corresponding



Fig 276.—Photograph of patient (Case III) taken after all stitches had been removed and the patient was up and about. The upper wound of exit (1) is seen just above the costal arch sternally at point midway between the left nipple line and the midsternal line, just lateral to line joining the umbilicus and left nipple. The site at which the second bullet lodged beneath the skin and was removed by small incision is seen just below the level of the umbilicus and just outside the left nipple line (2). The lower wound of exit (3) is seen at point just above the pubis, about 3 cm. to the left of the median line. The first incision is seen just below and parallel to the left costal arch, beginning above, just below the xiphoid, and extending downward and laterally across the left rectus muscle, which was completely divided. The second incision is seen along the lateral margin of the left rectus muscle beginning above, short distance below the umbilicus, and ending below short distance above the lower wound of exit.

to the transverse process of the fourth lumbar vertebra. This bullet was easily palpable lodged beneath the skin of the anterior abdominal wall just above the level of the umbilicus and just outside the nipple line (Fig 276 2)

A third bullet wound of entrance (Fig. 275 3) also the size of a .38-caliber bullet, was seen in the left buttock, and a corresponding wound of exit (Fig. 276 3) of about the same size was seen low down on the abdominal wall, at a point just above the pubis about 3 cm. to the left of the median line.

Head and Neck—Examination of the head and neck was negative except for a lacerated scalp wound in the midfrontal region about 1 cm. below the hair line and slightly to the left of the midline—a linear cut about 3 cm. in length evidently sustained by jumping through the glass door.

Chest—Examination of the chest showed no abnormal findings except on the left side where there was slight pneumothorax and a very slight hemothorax. There was no displacement of the heart to the right.

Abdomen—Examination of the abdomen showed dullness in the right flank extending to within three fingerbreadths of the umbilicus when the patient was turned on his right side. This dullness did not shift with change of position. There was no dullness demonstrable in the left lower quadrant of the abdomen. *Liver dullness was normal.*

Extremities were negative except for a ragged, lacerated wound of the left thenar eminence about 3 cm. in length, and a similar tear on the dorsum of the left hand, between the index and middle fingers. These cuts had undoubtedly been sustained when he broke through the glass door.

The patient was able to urinate. Examination showed that the urine contained much blood. It showed specific gravity 1029 reaction acid a trace of albumin (due to blood) no sugar no acetone. Microscopic examination showed no casts, but many red blood-cells. The blood examination showed hemoglobin 80 per cent red blood count 4,440,000 and leukocyte count 15,000.

Diagnosis.—From the course taken by the bullet with the point of entrance in the eleventh intercostal space about 5 cm. from the median line posteriorly and the wound of exit in the eighth intercostal space anteriorly it seemed probable that the bullet had perforated the left kidney possibly the pancreas the

stomach, the left lobe of the liver the diaphragm the pleura and the left lower lobe of the lung. The fact that the urine passed by the patient contained blood in large amount substantiated the belief that the kidney had been perforated. The second bullet, with its point of entrance immediately adjacent to the fourth lumbar vertebra and lodged just beneath the skin of the anterior abdominal wall below the level of the umbilicus and just outside the nipple line had probably perforated the intestines. One had to remember also that in case the patient had an unusually long sigmoid colon this also might have been perforated. The third bullet with its wound of entrance in the buttock and its wound of exit low down on the abdominal wall at a point just above the pubis and about 3 cm. to the left of the median line might have perforated the peritoneal cavity low down, with injury to the small intestine sigmoid or bladder or might have passed entirely extraperitoneally with possible extraperitoneal injury to the bladder.

Operation.—Although it was clear from the site of the bullet wound in the left eighth intercostal space that the bullet had traversed the left pleural cavity but as there was practically no pneumothorax or hemothorax, I decided not to explore the chest, but to at once open the abdomen. As the one bullet had passed from just above the left twelfth rib at about the scapular line and had come out in the eighth intercostal space it seemed reasonable to assume that the bullet probably had perforated the left kidney pancreas stomach transverse colon left lobe of the liver and left diaphragm. (Urine passed just before the patient was taken to the operating room contained much blood.) Accordingly as the pulse rate was slow and it seemed reasonable to believe that the kidney was not bleeding severely I decided not to first explore the kidney but to first explore the abdomen, and then after repairing all damage done there inspect the left kidney pouch from in front to see whether there was much blood in the perirenal space and depending on the amount of this, decide whether or not to expose the kidney. Accordingly my first incision (Fig. 276) was just below and parallel to the left costal arch, dividing all muscles including the rectus. As soon

as the rectus muscle was divided, a mattress suture of No. 2 chromic catgut was inserted into each of the two cut ends, including its anterior and posterior sheath, so as to prevent the cut ends from retracting within the sheath.

On opening the peritoneum and reflecting upward the upper margin of the wound the perforation in the diaphragm was seen and sewed up with a running silk suture going through the entire thickness of the diaphragm. Next, the left lobe of the liver was inspected and a tear about 3 cm. long at its left border was seen and although it was not bleeding, it was closed with two interrupted heavy plain catgut stitches, using a large fully curved non-cutting needle. This apposed the gaping edges of the wound. Next, the anterior wall of the stomach was examined and a .38-caliber perforation found at about its middle rather nearer the lesser than the greater curvature. This was at once closed for some stomach contents was escaping. The closure was made by means of interrupted through-and-through black waxed silk sutures, and then a row of continuous Lambert stitches of the same material to bury the first row. Both were placed at right angles to the long axis of the stomach to prevent narrowing. Next an opening was made in the gastrocolic omentum to permit examination of the posterior wall of the stomach, and there a similar perforation was seen in the stomach immediately behind the perforation through the anterior wall. It was repaired in the same manner. Next the pancreas was examined and a perforation seen. A small rubber drainage-tube was inserted into the lesser peritoneal cavity to drain any pancreatic secretion and any seeping from the gastric perforation. Then the opening in the gastrocolic omentum was sutured on each side up to the drainage-tube using plain catgut sutures. Next the transverse colon was examined and a perforation found in it slightly to the left of the midline and located near the mesentery. The perforation was closed by four through-and-through black waxed silk sutures placed at right angles to its long axis, and then buried by a purse-string suture of the same material. Next the duodenojejunal angle was located, and then the entire small intestine was examined systematically from its beginning to the

cecum. No perforations were found. The appendix was seen and appeared normal.

The abdominal incision was now closed in layers using No. 2 chromic catgut for the peritoneum and posterior rectus sheath together. Then the two mattress sutures of the same material which had been inserted into each of the two cut ends of the rectus muscle to prevent the ends from retracting within its sheath were tied together bringing the two cut edges in apposition. The muscles and anterior rectus sheath were now closed by a second chromic catgut suture. Several tension sutures of No. 12 black waxed silk were inserted and the skin closed with black waxed silk up to the drain.

The wound of exit (Fig. 276-3) just below the left ramus of the pubis was explored with the right index finger and the track did not seem to enter the peritoneal cavity but to make certain an incision was made along the outer margin of the left rectus (Fig. 276). There was a considerable amount of free blood in the left iliac fossa. The lower portion of the large intestine including the sigmoid was examined for a possible perforation but none was found. The possibility of an intraperitoneal perforation of the bladder was considered, but the examination was negative. As the entire small intestine had been examined through the upper incision, it was not necessary to repeat the examination of the small intestine. The free blood was now swabbed away and the incision closed in layers without drainage.

There was some active bleeding externally from the bullet wound of exit. In order to drain any possible extraperitoneal perforation of the bladder a rubber drainage-tube was inserted and a piece of iodoform gauze was inserted beside the rubber drainage-tube to control the hemorrhage.

The bullet palpated beneath the skin of the abdominal wall on the left side was removed by a small incision. It was a .38-caliber lead bullet. The wound was swabbed with tincture of iodine and closed with a silk suture. The bullet wounds in the back were swabbed with tincture of iodine and dry dressings applied.

The scalp wound was cleaned and sutured as were also the two lacerated wounds of the left hand.

While still on the table the patient was given 1500 units of antitetanic serum.

He left the operating room in fair condition.

Postoperative Course—When returned to bed his pulse was 96 and his condition was fairly good. When I saw him at 6 o'clock that evening his pulse was 110 and of good quality. He had only vomited once since the operation and that was immediately after his return from the operating room. Temperature was 102° F rectally. The second day after operation, June 25th the upper drainage tube was shortened about 5 inches and all tension sutures were removed. The lower drainage-tube and the iodoform gauze packing were entirely removed. His temperature gradually rose until on June 26th it reached 104° F rectally with pulse 128 and respirations 22. Examination at this time showed no findings of interest, except that there was a foul odor from the upper wound. Two stitches were removed and a new rubber drainage tube introduced. A considerable amount of very foul discharge escaped. The wound continued to discharge a large amount of this foul material the following day. Accordingly the wound was irrigated with Dakin's solution every two hours. Blood examination on the 28th showed a leukocyt count of 14,200. On June 29th all stitches were removed from both incisions. Following this the patient's condition progressively improved though he still continued to run a septic temperature reaching as high as 102.4° F in the evening of June 30th. On July 1st the upper wound was opened for its entire length.

In order to determine whether the patient's continued temperature might not be due to a perinephritic abscess in addition to the infection of the upper wound, an attempt was made to pass a probe into the upper posterior bullet wound but this was unsuccessful. For this reason aspiration was next performed under local anesthesia. A long needle was inserted deeply into the perinephritic area but repeated aspirations failed to reveal the presence of any pus. In order to rule out the possibility of a subphrenic abscess the needle was then inserted between the eighth and ninth ribs in the left anterior axillary line but no



Fig. 277—Roentgenogram (Case III) taken July 1st. This shows definite rounded defect in the left twelfth rib caused by the passage through it of the upper bullet, marked (1) in Fig. 275. A small splinter of the lower surface of the rib is seen to be torn away at this site and a fragment of the bullet is seen attached to this loose fragment. Several very small but very dense shadows immediately about the defect in the twelfth rib show where very small fragments of the bullet remained adherent to the rib during its passage through it. There is an area of increased density more or less oval in contour in relation to the twelfth rib, with its center at the site where the bullet had perforated the rib.

pnea was encountered. In order to corroborate these negative findings the patient was brought down to the x ray department. Fluoroscopic examination showed no evidence of subphrenic abscess. Roentgenograms were taken. The plates showed

While still on the table the patient was given 1500 units of antitetanic serum.

He left the operating room in fair condition.

Postoperative Course—When returned to bed his pulse was 96 and his condition was fairly good. When I saw him at 6 o'clock that evening his pulse was 110 and of good quality. He had only vomited once since the operation and that was immediately after his return from the operating room. Temperature was 102° F rectally. The second day after operation, June 25th the upper drainage-tube was shortened about 5 inches and all tension sutures were removed. The lower drainage tube and the iodoform gauze packing were entirely removed. His temperature gradually rose until on June 26th it reached 104° F rectally with pulse 128 and respirations 22. Examination at this time showed no findings of interest, except that there was a foul odor from the upper wound. Two stitches were removed and new rubber drainage-tube introduced. A considerable amount of very foul discharge escaped. The wound continued to discharge a large amount of this foul material the following day. Accordingly the wound was irrigated with Dakin's solution every two hours. Blood examination on the 28th showed a leukocyte count of 14,200. On June 29th all stitches were removed from both incisions. Following this the patient's condition progressively improved, though he still continued to run a septic temperature reaching as high as 102.4° F in the evening of June 30th. On July 1st the upper wound was opened for its entire length.

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Examination on admission showed that the patient was in moderate shock, his skin was rather cold extremities cold and mucous membranes pale. Pulse was 70 and of fairly good volume. Respirations were shallow regular and slow.

The examination of the head neck and chest showed no findings of interest, except that he was bleeding from his nose which had been injured.

The essential pathology was limited to the abdomen. There was a bullet wound of entrance (Fig 278) the size of a .38-caliber bullet located about 1 cm. to the left of the midline at the level of the tip of the xiphoid cartilage. There was a similar bullet wound of exit located about two fingerbreadths below the right twelfth rib and at a point about 3 inches to the right of the spine (Fig 279). The abdomen showed no tenderness or rigidity. There were no palpable masses. Percussion note showed some abnormal tympany but no abnormal area of dullness. The patient was not nauseated and did not vomit. A specimen of urine passed contained a large amount of blood but no clots. Examination of the urine showed color red, specific gravity 1030 reaction acid albumin ++++ no sugar red blood-corpuscles ++. A diagnosis of gunshot perforation of the liver and kidney was made. He was put to bed and external heat applied. 1500 units of antitetanic serum were administered. My intern asked another surgeon to see the case in consultation with him. This surgeon believed that on account of the fact that the patient did not vomit and there was no tenderness in the abdomen that no hollow viscera had been perforated, and as the patient did not present the picture of internal hemorrhage he advised merely treatment for the shock and no operative interference.

When I saw the patient the next morning his temperature was 99.4 F pulse 100 respiration 24. Auscultatory percussion showed the outline of the stomach as indicated in the photograph (Fig 278 S). Liver dullness was as seen on the same photograph (Fig 278, L). His abdomen was soft and there was no evidence of peritonitis or internal hemorrhage. For this reason operation was certainly not indicated at this time.

dense elongated shadows, one in the region of the pelvis of the right kidney and the second superimposed upon the right transverse process of the fourth lumbar vertebra, extending downward to the superior surface of the fifth lumbar vertebra. There was a definite rounded defect in the left twelfth rib caused by the passage through it of the upper bullet (Fig. 277). A small splinter of the lower surface of the rib was torn away at this site and a fragment of the bullet was attached to this loose fragment. Several very small but very dense shadows immediately about the defect in the twelfth rib showed where very small fragments of the bullet remained adherent to the rib during its passage through it. There was an area of increased density more or less oval in contour in relation to the twelfth rib, with its center at the site where the bullet had perforated the rib.

By the following morning, July 2d, the temperature had dropped to 101.2 F and the patient seemed very comfortable. On August 2d there was tenderness over the left loin quite severe on rather gentle pressure. The leukocyte count was 15,640. In view of the increased leukocyte count a perinephritic abscess was considered. On August 4th I had Dr. Koll cystoscope the bladder and catheterize the ureters. The bladder was found to be normal in every respect. The urine obtained from each kidney was entirely normal. From this time on the patient continued to improve and was discharged on August 12th cured fifty days after the accident.

CASE IV

M. F., a laborer nineteen years of age, Cook County Hospital, No. 793,293 was brought into my service at 11:55 P. M. March 30, 1922 by the police. According to the police report he was shot in a hold-up in which he was the victim. This occurred at 11:20 P. M.

On admission the patient was conscious and answered questions intelligently. He said he had been held up and the man shot him without any apparent cause. He did not remember anything else that happened until he came to himself about one block from the site of the shooting and was lying on the sidewalk.

Examination on admission showed that the patient was in moderate shock, his skin was rather cold, extremities cold, and mucous membranes pale. Pulse was 70 and of fairly good volume. Respirations were shallow, regular and slow.

The examination of the head, neck, and chest showed no findings of interest, except that he was bleeding from his nose which had been injured.

The essential pathology was limited to the abdomen. There was a bullet wound of entrance (Fig. 278) the size of a .38-caliber bullet located about 1 cm. to the left of the midline at the level of the tip of the xiphoid cartilage. There was a similar bullet wound of exit located about two fingerbreadths below the right twelfth rib and at a point about 3 inches to the right of the spine (Fig. 279). The abdomen showed no tenderness or rigidity. There were no palpable masses. Percussion note showed some abnormal tympany but no abnormal area of dullness. The patient was not nauseated and did not vomit. A specimen of urine passed contained a large amount of blood, but no clots. Examination of the urine showed color red, specific gravity 1030, reaction acid, albumin + + + +, no sugar, red blood-corpuscles + +. A diagnosis of gunshot perforation of the liver and kidney was made. He was put to bed and external heat applied. 1500 units of antitetanic serum were administered. My intern asked another surgeon to see the case in consultation with him. This surgeon believed that on account of the fact that the patient did not vomit and there was no tenderness in the abdomen that no hollow viscera had been perforated, and as the patient did not present the picture of internal hemorrhage he advised merely treatment for the shock and no operative interference.

When I saw the patient the next morning his temperature was 99.4° F., pulse 100, respiration 24. Auscultatory percussion showed the outline of the stomach as indicated in the photograph (Fig. 278, S). Liver dullness was as seen on the same photograph (Fig. 278, L). His abdomen was soft and there was no evidence of peritonitis or internal hemorrhage. For this reason operation was certainly not indicated at this time.

That morning he vomited for the first time. The vomitus contained undigested food and a few small blood-clots. This



Fig. 278.—Photograph of patient (Case IV) taken two days before his discharge from the hospital. Note the bullet wound of entrance, the site of .38 caliber bullet (B) located about 1 cm. to the left of the midline at the level of the tip of the xiphoid cartilage. The outline of the stomach (S) made out by auscultatory percussion, was outlined on the patient with ink. Note that the bullet wound of entrance lies just above the lower curvature of the stomach. The upper and lower border of liver dulness (L), as determined by percussion, have also been indicated in ink upon the patient as has also the cardiohepatic angle. The anterior area of liver dulness is indicated on the patient by the cross lines. From these outlines it is obvious that the bullet passed through the liver. This can be even better appreciated by noting the wound of exit (B) in Fig. 279.

blood was believed to be blood swallowed due to the hemorrhage from the injury to the nose. That afternoon the temperature was 99.6° F, pulse 86 and respiration 22. He vomited twice

that afternoon. The vomitus was dark green fluid and one specimen contained a few small blood-clots. The following day the temperature was normal. He vomited twice a fair amount of greenish fluid once in the morning and once in the afternoon, and did not vomit after this. The next day April 1st



Fig. 279—Photograph of patient (Case IV) taken a day before his discharge from the hospital. Note the bullet wound of exit (B) located about two fingerbreadths below the right twelfth rib and a point about 3 inches to the right of the spine.

the temperature remained between 99° and 100° F the entire day and the pulse varied between 80 and 90. On April 2d 3d 4th 5th and 6th the temperature remained slightly above normal but never over 100° F. On April 7th the noon temperature was 101.2° F pulse was 100 and respiration 22. The patient did not complain of any pain and seemed comfortable. Because

of this rise in temperature the possibility of subphrenic abscess was considered. Blood examination and roentgenologic examination were ordered. The blood-picture showed hemoglobin 80 per cent., leukocytes 12,200. Differential count showed small mononuclear lymphocytes 15 per cent., large mononuclear lymphocytes 6 per cent., polymorphonuclear neutrophils 78 per cent., eosinophils 1 per cent. The roentgenologic examination showed that the left diaphragm was almost as high as the right. The right half of the diaphragm moved more freely than the left, although the latter was not immobile. No subphrenic pathology could be determined. No pathology could be made out in the chest.

The next day the patient's temperature fell and the highest reading was 99.4° F. A leukocyte count showed that this also had fallen, and was only 8500. The temperature reached normal by April 15th and remained normal. The patient was discharged cured on April 17th, eighteen days after the accident.

Had I seen the patient at the time he was admitted to the hospital I believe I should have made an exploratory incision to determine whether or not the stomach was injured. Irrespective of the fact that the patient had not vomited. While the course pursued showed that the judgment of the surgeon who saw him in consultation with the intern was good in this case. In general I believe that every gunshot wound of the abdomen seen soon after the injury should have the benefit of an exploratory incision for diagnosis. This will be discussed later.

DISCUSSION

These 4 cases bring out many of the clinical problems presented by recent gunshot wounds of the kidney. In determining the course of treatment to be pursued in any particular case it is essential to be familiar with the surgical pathology and the symptoms as well as the objective findings.

Pathologic Anatomy—Gunshot wounds of the kidney occur in two forms—those in which the peritoneal cavity with its contents has also been injured (*intraperitoneal gunshot wounds of the kidney*) and those in which the injury is entirely extraperi-

toneal (*extraperitoneal gunshot wounds of the kidney*) The latter are far less common. As a rule either the abdomen or the abdomen and chest is perforated. In Laewen's¹ report of 42 gunshot wounds of the kidney in the recent war there were 37 cases in which the abdomen was penetrated and only 5 extraperitoneal cases. On the other hand he found that in 149 gunshot wounds of the abdomen there were only 28 cases in which a simultaneous injury to the kidney was found, that is in only 18.8 per cent. British statistics show that in 2121 gunshot wounds of the abdomen, the kidney was wounded in only 155 or only 7.3 per cent. (See Table of British Statistics on p. 675 under Prognosis.)

Rouvillots in his 232 cases of gunshot wounds of the abdominal viscera, found 15 extraperitoneal visceral wounds of which 8 involved the kidney. 48 wounds involving both the thorax and the abdomen, of which 4 involved the kidney and 169 intraperitoneal wounds, of which 6 involved the kidney.

The clinical picture presented by a case of gunshot wound of the kidney varies greatly depending upon the associated injuries present. The nature of the associated injuries depends upon the course taken by the bullet. The bullet may pass through the kidney and the entire abdomen, and any of the intra-abdominal organs may be injured. On the other hand, the bullet may pass through the chest, diaphragm and abdomen and the essential associated injury may be intrathoracic.

A. *Intraperitoneal Gunshot Wounds of the Kidney*—In a general way intraperitoneal gunshot wounds of the kidney may be classified into four groups, as suggested by Laewen.

1. *Intraperitoneal Injury of a Kidney with Hemorrhage in the Abdominal Cavity but Without Injury of Any of the Intra-abdominal Organs*—These are very rare. Case II is an example of this type. Laewen had but a single case of this type in his 42 cases. His case is almost identical with mine. An infantry bullet had perforated the right kidney from behind. Laparotomy

Laewen, A. *Ergebnisse der Chirurgie und Orthopädie*, 1918, vol. 10, pp. 611-601.

Bull. et Mem. de Soc. de Chir. de Paris, 1916, 42, 708.

showed much blood in the peritoneal cavity and the bullet was found below the liver. Transperitoneal extirpation of the severely damaged kidney was performed and the patient recovered. Faust also reports a single case. The bullet entered the abdomen beneath the left costal arch and passed through the entire peritoneal cavity without injuring any of the intestines passing out in the neighborhood of the splenic flexure and lodging in the left kidney. Thelen reports a case where a bullet entered beneath the right costal arch penetrated the entire peritoneal cavity without any injury to the intestine and passing out of the peritoneal cavity injured the right kidney. Burchhardt and Landolt² also report a single case. A fragment of hand-grenade perforated the left kidney from behind and remained embedded close to the spleen. An abscess the size of the fist developed between the spleen, splenic flexure stomach and kidney resulting in a fatal peritonitis.

The blood found in the abdomen in these cases comes in part from the damaged kidney and enters the peritoneal cavity through the small perforation in the posterior parietal peritoneum caused by the bullet in its passage. In my Case II the blood found in the peritoneal cavity probably came in part from a retroperitoneal hematoma but also in part from the perforation of the mesenteric of the descending colon.

2. *Right Intraparietal Gunshot Wounds of the Kidney with Injury to the Liver*—These occur most commonly in gunshot wounds of the right upper quadrant of the abdomen. The hepatic flexure of the colon or the adjacent ascending colon or transverse colon are often simultaneously injured. In other cases the bullet penetrates the right lower portion of the chest wall also the pleura and lung and perforating the diaphragm, passes through the liver and kidney. These cases of simulta-

Faust: *Chirurgie im Kriegesdienst*. Berl. Klin. Woch. 26, Kriegschir. Heft 3, 1915.

Thelen: *Über bemerkenswerte Nieren- und Blasenverletzungen*, Zeitsch. f. Urol., 10, 3, 1916.

Burchhardt and Landolt: *Die pathologische Anatomie und Behandlung der Bauchverwundungen*, Brauns Beitr. klin. Ch. 1916, Bd. 103 Heft. 25 and 26. Seebater Kriegschirurgischer Band.

neous injury of the right kidney and the liver are common, as in Case IV. While the above mentioned combinations are the most frequent almost any combination of associated injury to intraperitoneal organs may occur.

3 *Intraperitoneal Gunshot Wounds of the Kidney with Damage to the Spleen*—These occur most commonly in gunshot wounds of the left upper quadrant of the abdomen. The splenic flexure or the adjacent portion of the transverse colon or the descending colon may be injured also the diaphragm, pleura, lung and chest wall.

4 *Intraperitoneal Gunshot Wounds of the Kidney with Perforation of the Stomach or Small Intestine*—Here also there may be perforation of the diaphragm, pleura, lung and chest wall as in Cases I and III. The pancreas and left lobe of the liver may be injured in these cases as in Case I.

B *Extraperitoneal gunshot wounds of the kidney* comprise those cases in which the peritoneal cavity has not been entered. These may occur when the bullet passes tangentially through the lumbar region. They may also occur in tangential perforations through the thorax and then are associated with local pneumothorax.

In general, extraperitoneal gunshot wounds of the kidney are not so serious as the intraperitoneal type. However the aorta and inferior vena cava may be perforated in this type of case. Also there may be injury to the spinal column and cord. In extremely rare cases both kidneys may be simultaneously perforated. Finally the damage to the kidney may be entirely an *indirect injury to the kidney* in the form of a concussion or even rupture. The former has been seen in tangential wounds through the lumbar region and the latter in case of tangential gunshot wounds through the thorax. In these cases of indirect injury to the kidney it is believed that the ribs immediately behind the kidney transmit the blow to the kidney which is broken in the form of deep tears. Burkhardt and Landolt report a case in which a horizontal gunshot wound at the level of the first lumbar vertebra had splintered the eleventh and twelfth ribs near their vertebral attachment, and completely

destroyed the kidney. They explained the kidney damage in this manner.

On account of the small size of the kidney it is rare to find the bullet retained in the kidney.

The damage to the kidney may be no more than a tract the size of the caliber of the bullet, though this is rare. Ordinarily there is considerable destruction of the parenchyma, as the result of hydrodynamic action. This is particularly true in the case of high-powered rifle wounds. When the injury is near one pole the entire pole may be more or less torn away. There is usually hemorrhage into the parenchyma beyond the area that is damaged. This is well shown in the kidney removed from Case II (Figs. 272-274). The kidney may even be divided into two halves. In all cases in which there is much destruction of the kidney proper due to the direct action of the bullet, there is always considerable tearing of the fibrous and fatty capsule. It is not uncommon that in cases in which the damage to the kidney parenchyma is not very extensive the entire fibrous fatty capsule may be torn away so that the entire kidney hangs on its pedicle completely decapsulated, as in Case II. In the case of rifle bullet wounds this is due to the bursting action caused by the bullet. In Case II I believe the capsule was stripped by hemorrhage.

When the kidney parenchyma has been damaged the bleeding is usually considerable and may in certain cases lead to death very rapidly. In rare cases even when the damage to the kidney is severe the bleeding may be slight. The blood ordinarily flows down into the pelvis and the urine passed by the patient or that obtained by catheterization soon after the injury almost always contains blood. Not uncommonly the amount of blood present in the urine is so great that the urine has the appearance of being almost pure blood, as in Case II. The absence of blood in the urine is extremely rare. The blood that escapes about the kidney is found in the perirenal space where it may form a localized hematoma but more often it spreads out in the retroperitoneal tissues and may extend medially as far as the vertebral column and downward along the

iliopsoas muscle or even between its muscle-fibers. It may also spread forward between the two layers of peritoneum, forming the mesentery of the transverse colon, descending colon, and of the sigmoid flexure until the bowel is reached. On exploratory laparotomy one may therefore see this blood as a blue-black hematoma in the transverse and descending mesocolon and just behind the posterior parietal peritoneum. This was noted in Case II, but in this case it was not possible to be certain whether the blood seen between the two layers of the mesentery of the descending colon was due to extension forward of the blood from the retroperitoneal hematoma or was due to bleeding from the site at which the mesentery was perforated, because at this time there was no active bleeding from the perforation in the mesentery. As was mentioned before the blood may extend forward through the bullet hole in the posterior parietal peritoneum and enter the peritoneal cavity. When the bullet has perforated the diaphragm the blood from the kidney may similarly extend into the pleural cavity. In cases in which the gunshot wound of the soft tissues is large the blood may escape externally and this at once. It is rare that the gunshot wound of the kidney is limited to the pelvis. It is not quite so rare to find the injury limited to the renal artery and vein. Enderlen and Sauerbruch report a case of injury to the right renal vein in which the patient was saved by an immediate nephrectomy.

Symptoms and Diagnosis.—**Shock**.—If a patient is seen soon after receiving a gunshot wound of the kidney be it an extra-peritoneal or an intraperitoneal injury with perforation of any combination of the viscera, shock is often, though by no means always present. In the first 3 cases here presented shock was absent, while in the fourth case moderate shock was present. When the patient does present symptoms of shock it is often extremely difficult to determine the cause. In most cases it is probably the result of severe hemorrhage. Contributing factors may include the irritation of the peritoneum by escaped blood or escaped gastric or intestinal contents.

Vomiting, nausea and bloating are inconstant symptoms, and their evaluation in the matter of diagnosis is difficult. Their absence during the first five hours following an injury does not at all rule out the presence of perforation of the liver, stomach, intestines or any other viscera. However statistics seem to show that in gunshot wounds through the intestine approximately two-thirds of the cases vomit within the first five hours. When it does occur during this time it usually occurs but once rarely repeated. If the early vomitus contains blood it is very suggestive of a perforation of the stomach or the intestines. In some patients the vomiting may be repeated or there may be long-continued nausea. If this is present, it is suggestive of a severe intra-abdominal injury. Vomiting may be present in the absence of any injury to the intestine and cases have been reported in which in addition to the vomiting the abdomen showed marked rigidity and at operation the only findings were hemorrhage from the liver mesentery etc. without any injury to the intestine. This is probably explained by stimulation of the vagus endings caused by the escaped blood. Even in the presence of severe injury to the intestinal tract vomiting may be entirely absent, as in Cases I and III. These cases, however are the exception. In gunshot wounds through the retroperitoneal tissue without any intra-abdominal injury vomiting may be present. If vomiting has been absent during the first few hours following the injury but appears later and in increasing frequency it is very suggestive of injury to the gastro-intestinal tract. In case the liver has been perforated without any associated injury to the intestine, vomiting occurs less often than when the intestine has been perforated. It has been observed that when vomiting occurred during the first five hours and operation was performed during this period the mortality was slightly higher than in the patients in whom no vomiting occurred.

Abdominal Rigidity and Tenderness on Pressure—Generalized abdominal rigidity is the most frequent and most important early symptom of gunshot wound of the abdomen. It usually is associated with tenderness on pressure of the abdominal wall. However as is well known, this abdominal

rigidity may occur in gunshot wounds through the thorax which do not perforate the abdomen. In these cases the rigidity is due to irritation of the intercostal nerves or to the presence of blood, irritating the diaphragm. It may also occur in extra-peritoneal gunshot wounds of the kidney due to irritation of the intercostal nerves outside the peritoneal cavity or due to a collection of blood in the retroperitoneal tissues. While it is true that extreme rigidity of the abdominal wall combined with tenderness on pressure is suggestive of severe intra-abdominal injury especially when associated with the other symptoms of peritoneal irritation, it must be remembered that this rigidity may be present due to intra-abdominal hemorrhage alone without any injury to the intestine. It is not at all unusual to find cases in which the intestine has been perforated without any rigidity of the abdomen being present. The tenderness on pressure may be diffuse over the entire abdomen far removed from the tract of the missile. In other cases the rigidity is localized. In these cases it usually corresponds to the location of the intestinal injury. One must remember that rigidity of the abdominal wall may be present in gunshot wounds limited to the abdominal wall, and may even be very marked in these cases and may last for two days or more. Similarly in gunshot wounds through the chest without any intra-abdominal injury the rigidity has been seen to last for as long as four days. In all tangential gunshot wounds along the lower costal margin the rigidity of the abdomen on the corresponding side is particularly well marked and may last two days or more. It is apt to be associated with severe long-continued pain in the corresponding lower half of the abdomen. In the case of retained projectile in the retroperitoneal tissue it is the rule to find a marked abdominal rigidity. This is often associated with tenderness on pressure in the corresponding area. It is clear therefore that *marked abdominal rigidity does not at all indicate that the intestines have been perforated*. When the abdominal rigidity is caused by the presence of blood in the peritoneal cavity without any injury to the intestinal tract, or when it is due to blood in the retroperitoneal space or to intrathoracic

hemorrhage with blood above the diaphragm the generalized abdominal rigidity is ordinarily not so marked as in case it is due to perforation of the gastro-intestinal tract. In the latter case the tenderness on pressure is similarly apt to be more marked. In case of hemorrhage the tenderness on pressure of the anterior abdominal wall is apt to be unilateral and limited to the side of injury. In intraperitoneal gunshot wounds of the kidney abdominal respiration is likely to be absent and respiration is entirely costal. Abdominal rigidity with generalized tenderness on pressure is present in more than half of the cases of gunshot wounds of the intestine and in cases of hemorrhage into the peritoneal cavity such as occurs in gunshot wounds of the liver and spleen.

Pulse—The pulse may remain essentially normal both as to rate and volume no matter what viscus has been perforated. In case the patient is in shock he may be pulseless or the pulse may be fluttering but this is the exception. In about one-third of the cases with associated gastro-intestinal perforation the pulse remains approximately normal, though frequently the tension may be somewhat lower than normal. In about two-thirds of these cases even a few hours after the injury the pulse is small and more rapid than normal and shows decreased tension and may show irregularity both as to rate and volume. In case of gunshot wounds of the liver without marked hemorrhage into the abdominal cavity the pulse is usually practically normal, as in Case IV at times even somewhat slowed. This was noted in Case I. Finsterer¹ first called attention to the occurrence of bradycardia (slow pulse) in injuries of the liver and considers that this is typical of rupture of the liver. His attention was first attracted to bradycardia in liver injuries in case of gunshot wound of the liver. While it is true that bradycardia is frequently seen in case the hemorrhage from the liver is slight or even moderate whenever the hemorrhage is severe tachycardia eventually develops. For this reason slow or normal pulse does not rule out hemorrhage from the liver and should

Finsterer H. Ein gebilter Fall von Leberectus. Wiener klin. Wochenschr. 1910, No. 49 S. 1749

not delay one from an exploratory operation. If one waits until the pulse becomes rapid he will often lose the best chance for the patient in the cases of hemorrhage from the liver. In case the spleen is perforated the pulse-rate may remain approximately normal if the bleeding is only slight, but when the hemorrhage is more marked the pulse rate is always increased. One must be guarded therefore, by other signs of hemorrhage as the patient's general appearance pallor of the lips etc. In case the pulse in the first hours after the injury rises above 120 the prognosis is correspondingly more grave.

Shifting Dulness in the Flanks—The presence of dulness in the flanks which may or may not show shifting on change of position, is a very uncertain symptom for its demonstration on physical examination is possible only when the free fluid is of rather large amount. In these cases one cannot be certain whether the fluid is blood or escaped gastric or intestinal contents but in either event the indication for immediate exploratory operation is the same. One must not forget that in case of slow bleeding from the liver the blood may coagulate soon after it has escaped from the liver and in these cases the dulness may not be present in the flanks but as an area of abnormal dulness near the liver. In other cases of slow bleeding from the liver the blood may remain diffused between the intestinal loops, and may be in large amount without being demonstrable at all by physical examination. Finally one must be careful not to mistake the shifting dulness in the flanks, which not rarely is due to fluid in the large bowel for free fluid in the abdominal cavity.

Obliteration of the Liver Dulness—In case the stomach or intestines are perforated the escaped air may cause obliteration of the liver dulness but one cannot rely upon this finding in arriving at a diagnosis of perforation of the gastro-intestinal tract. It cannot be demonstrated in more than about one third of these cases. When it is present the finding is striking and is of great value. Its absence does not in the least speak against the presence of a perforation of the stomach or the intestines as in Cases I and III. In case one suspects such a per-

foration, and this finding is not demonstrable, fluoroscopic examination or roentgenograms with the patient in an upright position may show definitely the presence of free air in the peritoneal cavity in the form of a small, light zone between the upper border of the liver shadow and the diaphragm.

Other signs of intraperitoneal damage are of much less importance. Elevation of the testicle due to a reflex cramp of the cremasteric muscle is occasionally seen. It has been recorded in perforation of the stomach, large and small intestine, liver and gall-bladder and urinary bladder. Rare cases are reported of bilateral elevation of the testicle where one of these organs and one kidney were perforated. It may occur in intraperitoneal gunshot wounds of the kidney where there is no intra-abdominal injury.

In rare cases bile or gastric or intestinal contents may escape through either the wound of entrance or exit.

Where the bullet has passed through the liver the pain may be referred to one or both shoulders, more usually the right. This is, however, a rare finding.

Irrespective of what other symptoms are present in a patient who has sustained a gunshot injury in the region of the kidney, the presence of a hematoma in the loin or of blood in the urine makes the diagnosis of a gunshot injury to the kidney highly probable.

All patients who have sustained a gunshot wound through the abdomen should be catheterized at once unless they can urinate and the urine obtained should be examined for blood. Retention of urine is common when the kidney has been injured. *The presence of blood in the urine is the most important evidence that the kidney has been injured.* In case the urine does not contain blood but the course of the bullet makes one suspect that the kidney has been injured, cystoscopic examination and ureteral catheterization should be carried out.

In the absence of hematuria the diagnosis should always be considered: cases which present a hematoma in the loin.

Prognosis.—The prognosis of gunshot wounds of the kidney depends upon the severity of the damage done to the kidney.

and in the average case even more upon the gravity of the associated injuries.

When the injury done to the kidney is slight, and no serious associated injury is present, the outlook is good. Small perforations of the kidney heal spontaneously as in Cases I III and IV

TABLE SHOWING INCIDENCE AND OPERATIVE MORTALITY OF RENAL WOUNDS OPERATED UPON AT THE FRONT (EXCLUSIVE OF THORACIC WOUNDS)¹

Operation.	Total number of renal wounds reported.	Total mortality per cent.	Total kidney wounds.	Per cent.	Total kidney wounds.	Per cent.	Unoperated kidney wounds.	Mortality.	Per cent.
Colonel Cuthbert Wallace ^a	965	53.9	73	7.5	22	30.1	34	6	17.6
Captain A. L. Lockwood ^b	356	52.0	23	9.5	13	45.5	13	4	30.8
Captain J. Fraser ^c	300		29	9.6	12	41.4	12		
Captain C. F. Walters ^d	500	51.0	20	4.0	8	40.0	10	4	40.0
	2121	52 (7)	155	7.3	57	36.8	69	14	24.6 (7)

Manual of Military Urology A. E. F. 2d ed., Mason et al., Editors, Paris.

Wallace, Cuthbert Brit. Jour Surg. 1917 iv 679

Lockwood, A. L. Brit. Med. Jour. March 10, 1917 p. 317

Fraser J. Ibid., p. 321

Walters, C. F. Lancet, 1917 cxvii, 207

Laewen, in a collective review of the German statistics in the recent war together with a report of his own series, states "The prognosis of gunshot wounds of the kidney is good in light cases, extraperitoneal and intraperitoneal without injury to the intestine very doubtful where the organs have been torn, practically hopeless in gunshot wounds through the intestine and kidney. He points out that in his own series of 34 gunshot wounds through the abdomen and kidney only 3 were cured that most reported 7 intraperitoneal gunshot wounds of the

Most Zur Prognose und Behandlung der Bauchverletzungen im Kriege, 1916, Br. 100, Vierter Kriegschirurgischer Band, Heft 16.

kidney with associated liver or intestinal injury and that all of these 7 died and that Burkhardt and Landolt reported 16 intra-peritoneal gunshot wounds of the kidney only 2 of which they saved. All their cases in which the intestine was injured died. This makes a total of 5 cases with only 5 cures or a mortality of 87.7 per cent! And only 2 of these cases saved out of the 57 had injury to the intestine.

In marked contrast to this extremely high mortality the table of British statistics (page 675) is of interest.

In civil practice the mortality should be even still lower for the general condition of the wounded soldier is quite different from that of a normally healthy individual who has not undergone the exposure and hardships of war.

Treatment.—In a general way one may state that where the indications are that the injury done to the kidney is probably slight, as far as the kidney injury is concerned one should proceed in a conservative manner.

The injury to the kidney is characterized chiefly by hematuria and internal hemorrhage. Even if the urine passed or obtained by catheterization appears to be almost pure blood, this does not of itself indicate operative interference. It is only when the hematuria persists in spite of rest that operation is essential. In general it is not the amount of the hematuria that demands operation, but its persistence that is, usually after several days. Immediate intervention is indicated only in case of severe internal hemorrhage. In these cases if the hemorrhage is from the kidney nephrectomy is usually indicated as in Case II.

If the course of the bullet indicates that the abdomen has been perforated I believe an exploratory laparotomy to determine the nature and extent of the intra-abdominal injury is indicated as soon as the general condition of the patient will permit. If the patient is in shock, the usual treatment for shock should be carried out before any operative interference is undertaken, unless there is reason to believe that the shock is due to hemorrhage. Except for this immediate exploration of the abdomen is indicated.

In cases in which the chest as well as the abdomen has been

perforated if the chest findings and symptoms lead one to believe that grave injury to the lung is present as marked signs of hemothorax and pneumothorax, with marked dyspnea and cyanosis, very rapid pulse and marked displacement of the heart, it may be necessary to perform an open operation on the chest to repair the lung and check the bleeding. In such cases trans-thoracic laparotomy is of great value. The transthoracic approach affords especial advantage for exploration and treatment of the damage done within the chest and for suturing the diaphragm, which should always be done. It permits also the treatment of the intra-abdominal organs especially well those just beneath the diaphragm whether there is a diaphragmatic hernia or not and is of especial value in high perforations of the liver if these require local care. A separate laparotomy may sometimes be needed in addition though rarely for the opening of the thorax and abdomen by a single incision permits adequate treatment of both intrathoracic and intra-abdominal lesions.

In case the symptoms and objective findings indicate that only slight damage has been done to the chest, that is when respiration is not much affected and there is no special cyanosis or dyspnea, and when the signs of hemothorax and pneumothorax are only slight or moderate. It is best not to interfere in the thorax. The usual aspiration of the hemothorax can be done later according to generally accepted principles. The chest condition should be left undisturbed during the primary operation as in Cases I and III. The later care of the intrathoracic pathology presents nothing of special interest. The usual indications are followed.

On general principles, all recent wounds of the abdomen should be operated upon except when the lesion is without doubt limited to the liver and there is no symptom of serious hemorrhage. In this connection I wish to again call attention to the fact that a slow pulse of itself does not rule out serious hemorrhage from the liver especially early. This was discussed in considering the pathology and so will not be further explained. The operation should be performed as early as possible except when the patient is suffering from shock as was mentioned

previously. When there is doubt as to the relative seriousness of the shock and that of the hemorrhage, it is better to operate, particularly as it is possible that the hemorrhage is the chief cause of the shock. The intra-abdominal injuries require the customary surgical care.

When the course of the bullet has been through the abdomen and the kidney the question often arises whether it is better to open the abdomen first or to expose the kidney first if the kidney will probably need to be exposed

If the patient is suffering from severe internal hemorrhage and if as in Case II, the findings lead one to believe that the bleeding is chiefly from the kidney the kidney should be exposed first. If the bullet has traversed the abdomen as well as the kidney it is probable that the intestinal tract has been perforated and it is better to avoid the danger of carrying infection into the retroperitoneal space by first exposing and treating the kidney before opening the abdomen.

In any case of doubt as to whether to expose the kidney first or the abdomen first always expose the kidney first

When it is probable that one will not have to attack the kidney at all, one may do an exploratory laparotomy first, and after caring for the damage done within the abdomen, one may inspect the posterior parietal peritoneum about the kidney and be guided by his findings.

As far as transperitoneal approach to the kidney is concerned experience and especially that learned during the war has shown that the transperitoneal route can only be recommended in cases in which at laparotomy one has made certain that the gastro-intestinal tract has not been perforated. The danger of infecting the retroperitoneal tissues is too great. In such cases the lumbar exposure is the method of choice. If after exposing and treating the kidney it is desired to inspect the abdomen, this can be done as in Case II by continuing the incision forward. If, as in Case II, a large incision in the abdomen is needed the forward portion of the incision can be carried upward or downward as indicated. In any case no matter by which route the kidney has been exposed, it is essential, par

ticularly if the kidney has not been removed, to drain from behind.

The technic of the nephrectomy if indicated is the usual. However in case the fibrous and fatty capsule have been stripped entirely away as in Case II subcapsular nephrectomy is performed as described in considering Case II.

Slight hemorrhage from the kidney may be treated by tamponade. Küttner¹ recommends that in case one pole is shattered and is bleeding the pole be freely exposed and ligated as a whole using a very heavy ligature placed proximalward from the pole. Nephrectomy is however usually preferable.

Late operations or secondary operations are usually indicated because of secondary hemorrhage infection urinary infiltration, and urinary fistula that show no tendency to spontaneous closure.

In case secondary operation is necessary great care must be given to not injure the peritoneum, which is almost always firmly attached by numerous inflammatory adhesions and is easily torn into with great danger of secondary peritonitis. In these cases the peritoneum is often drawn backward toward the kidney.

As none of the cases here presented required secondary operation, these late operations will not be discussed.

In closing it may be of interest to recall the information prepared in the office of the Surgeon General and published by the United States Army Medical Department in Review of War Surgery and Medicine September 1918 Vol. I, No. 7 pp. 47-49. The following treatment was advised:

1. Inspect urine for blood (catheterize if necessary)
2. Treat shock in the usual manner—by warmth and transfusion.
3. If in doubt whether or not to operate, the most prudent decision is usually the wisest.
4. If in doubt whether to open the belly or loin first, open the loin.

5 The loin incision should be transverse and should extend approximately to the edge of the rectus. It may be enlarged by a vertical transectus incision or by vertical incision along the outer border of the erector spinae muscle long enough to permit division of all muscular and ligamentous attachments to the last rib. The twelfth dorsal nerve and artery may be avoided by placing the transverse incision a fingerbreadth below the rib. Thus also one avoids the danger of inadvertently entering the pleura through mistaking the eleventh for the twelfth rib.

6 If there is a wound of the loin and hematoma, or if the wound plainly leads to the kidney enlarge it transversely deliver the kidney and examine the hilum for lesions of the renal vessels.

(a) If the main artery or vein, or the upper main branch of the artery is wounded perform nephrectomy.

(b) If smaller arteries or the lower branch of the renal artery are wounded, excise a cone-shaped portion of the kidney corresponding to the area supplied by this vessel.

(c) Excise contused parenchyma in neighborhood of wound.

(d) Explore renal pelvis for foreign bodies with finger or probe.

(e) Suture a torn pelvis with interrupted plain catgut. Use no silk or other permanent sutures for fear of secondary stone formation or persistent fistula. There is no need to suture the pelvis with great nicety. The wound will heal if the ureter drains properly.

(f) In order to insure ureteral drainage and to prevent blood-clot from blocking its orifice, lead split tube or few strands of silk-worm gut, into the upper end of the ureter. (To be removed in forty-eight hours.)

(g) Suture parenchyma with heavy plain catgut deep sutures about 2 cm apart, and, if necessary interposing more superficial sutures to stop bleeding. All deep sutures should be placed at right angles to the long axis of the kidney in order not to obstruct the arteries.

A small tube should be left in the pelvis of the kidney two days, if this has been opened in order to evacuate blood-clots

and to hasten the return of kidney function by removing intra pelvic pressure.

(k) Always open peritoneum in front of the colon in order to examine the adjacent viscera.

(l) Drain and suture the wound in the usual manner

7 If more than one-third of the kidney is contused, perform complete nephrectomy if less, resection may be considered.

8 If hematuria suggests a renal injury but the wound is remote from the loin, the decision in favor of or against immediate operation should be based on the following data

(a) If the patient is going to die of primary renal hemorrhage he is likely to do so before reaching the dressing station.

(b) Though exploration of renal wounds usually starts a fresh parenchymatous hemorrhage it discloses the fact that the primary bleeding has already stopped

(c) Therefore unless an external wound leads directly to the kidney region, the presence of hematuria or of retroperitoneal hematoma is no indication for immediate operation.

9 A retroperitoneal hemorrhage discovered in the course of a laparotomy may be disregarded (it often does not arise from the renal vessels at all) unless it is of enormous size in which event it should be evacuated extraperitoneally before the intestines are much handled for it has been found that immediate grave shock results from turning the patient over and operating upon his loin after laparotomy

10 Transperitoneal nephrectomy is generally condemned.

CLINIC OF DR. CAREY CULBERTSON

COOK COUNTY HOSPITAL

ECTOPIC PREGNANCY

History of Present Case. Diagnosis of Ectopic Pregnancy
Treatment Employed. Important Points to Be Remembered in
Connection with the Clinical Aspect of Ectopic Gestation.

THE case for demonstration on this occasion brings up the topic of ectopic pregnancy since the symptoms and findings point very strongly to such a diagnosis.

The patient is thirty-two years of age, married and a domestic by occupation. She entered the hospital two days ago complaining of pain in the lower abdomen and back. This pain has been present on and off for four years, the onset being gradual and bothering her only at intervals, and generally in the left side. Recently it has been a constant, dull, heavy pain. There is no history of a severe acute onset at any time such as would necessitate her going to bed. There is no history of any attacks characterized by chills and fever or nausea and vomiting. Since the pain has been more or less constant, that is, during the past five or six months she has noticed a rectal tenesmus or at least pressure low down in the pelvis. A more striking symptom in her case is that of recent amenorrhea followed by metrorrhagia.

Her menses began when she was thirteen years of age. They have come every twenty-eight days of five days duration, moderate in amount, and always associated with cramping pain. Her last regular period occurred January 13th. In February the period did not appear and eight days after it was due, fearing that she was pregnant, she went to a doctor and had

an instrument passed into the uterus. Three days later she began to bleed and for one week this hemorrhage was associated with severe cramping pain in the pelvis. She bled rather freely with some clots for one week, and since that time has continued to bleed more or less every day though there has been severe hemorrhage at no time. Associated with this has been increasing pain in the left lower abdomen and in the back, in other words, it is now approximately nine weeks since the uterine bleeding was noticed and during this time she has been suffering pain and distress.

The patient has had 2 children, 1 of whom is living and well. Both were born spontaneously. Her last pregnancy was five years ago.

Examination reveals a patient who is fairly well developed and nourished and not acutely ill. Her temperature is normal leukocytes 6400 hemoglobin 85 per cent. The urine is normal and the Wassermann test is negative.

On examination the abdominal wall is thin, diastatic, and flabby and there are no tender points, but in the lower left quadrant a small swelling is palpable. This is low down and is firm and fixed. Vaginally there is a moderate relaxation. The vagina is short and distensible. The cervix is up behind the symphysis fixed, and split to the left so that it gapes. The corpus and fundus are indefinite but the body of the uterus is apparently involved or included in the mass that is palpable in the left iliac region. The entire pelvis is occupied by a firm, brawny mass filling it from side to side and bulging down posteriorly and laterally and continuous with the mass palpable in the left iliac region. There are no tender areas on palpation.

In considering the diagnosis in this case we must take into consideration, first, the history of long-continued pain in the left side which strongly suggests some chronic illness most probably of an inflammatory nature second the period of five years which has intervened since her last pregnancy also is suggestive of an inflammatory involvement most probably of the tubes, and hence responsible for the secondary sterility. The menstrual disturbance which is altogether recent strongly suggests preg-

nancy either a uterine pregnancy that was disturbed and aborted or pregnancy in the left tube which has been disturbed and hence led to hemorrhage. If we had seen this patient prior to last February we should probably have found some mass formation on the left side with fixation of the uterus representing a salpingitis if indeed not a general pelvic peritonitis chronic in type. At this time, however we have a very definite mass formation with considerable pain but no tenderness and such a mass being present after a history of menstrual disturbance and an attempt at induction of abortion, leads us to suspect that the pregnancy if it had occurred was most probably in the left tube. It is true, of course, that there may have been no pregnancy at all, since menstrual disturbance is present in a relatively large proportion of cases of chronic pelvic peritonitis, but this disturbance is more often an increased menstrual frequency without periods of amenorrhea. It is possible, too that there was a uterine pregnancy and that the attempt to induce abortion perforated the uterus, and so gave rise to either hemorrhage from the uterine wound which has filled the pelvis or to a general pelvic peritonitis which has extended to all parts of the pelvis and possibly become suppurative or again it is possible that the patient was not pregnant at all, but that the attempt at inducing abortion has stirred up an old chronic inflammatory process which has developed likewise into a general suppurative peritonitis. In extensive mass formations filling the entire pelvis we are constantly confronted with a differentiation between abscess that is, pus as contents of the mass or hemothecoe that is a pelvis filled with blood the result of traumatism or more frequently an ectopic pregnancy which has either ruptured or aborted. In the absence, however of a definite leukocytosis, of a history of fever and chills of an illness sufficiently severe to send this patient to bed the chances are that this mass is not due to suppuration. On the other hand, it is equally true that pelvic hemothecoe gives rise to some increase in leukocytosis and that it is not infrequently associated in what might be termed its chronic stage with a low-grade fever. Many of these cases of hemothecoe due to tubal pregnancy especially

where the process has been present for some time show a degree of leukocytosis and a temperature as high as 99.5° or 100° F. Where the hemorrhage has taken place some time prior to examination, and particularly where there is a history suggestive of previous infection, we must also consider the possibility of both processes being present, that is to say the mass in the pelvis may be a simple hematocoele or it may be an infected one infected either from a preceding pus-tube or an ovarian abscess, or infected from the intestinal tract or through the uterus.

In the last three months I have seen 4 cases of ectopic pregnancy associated with suppuration. In one the patient's blood showed 16 400 leukocytes and a temperature of 100° F. The pelvis was filled with old but fluid blood which bore a strong colon bacillus odor evidently due to infection after the spilling of blood from the right tubal pregnancy. It was uncertain whether this represented a ruptured or an aborted pregnancy. In addition, this patient had a small uterine fibroid and a chronic nephritis. Culture was negative.

In the second case the patient's blood showed a leukocyte count of 33 400 and she had been running a septic temperature since admission to the hospital, a temperature which, however never rose above 101.8° F. The patient had been taken acutely ill three weeks prior to operation with nausea and vomiting, chills, fever and pain in the right lower abdomen. There had been no preceding menstrual disturbances. Here again the pelvis was occupied by a large amount of free and dark, clotted blood which escaped freely under pressure and which had a strong colon bacillus odor. The pregnancy was in the isthmus of the right tube and represented a so-called rupture. Here culture was positive for the *Bacillus coli*.

In the third case the leukocytes varied from 12 600 to 16,000 and the temperature did not rise above 100.4° F. Upon operation the pelvis was filled with thin and clotted blood, with thick fibrin layers, the pregnancy being in the outer portion of the right tube and representing a so-called tubal abortion. Both tubes represented subacute pyosalpingitis.

The fourth patient was admitted to my service only this

present month and was in an extremely serious condition, suffering from general suppurative peritonitis, with a leukocyte count of 21,200 and temperature varying from 97° to 100.4° F. The pulse was constantly high, thin and irregular at times. Her last period had occurred in January with amenorrhea in February and March. She had been sick apparently for about one week. Owing to the gravity of her condition no operation was attempted, but from the findings on examination and her history a diagnosis was made of probable ectopic pregnancy on the right side together with a general suppurative peritonitis. This patient died three days after admission to the hospital. Autopsy revealed a fetal peritonitis and right ectopic pregnancy which was infected and which had ruptured into the right broad ligament, with perforation of the peritoneum. The uterus showed decidua thickening of the endometrium. There was a chronic fibrous endocarditis dilated mitral and tricuspid valves with incompetency and marked stenosis and hypertrophy of all the chambers of the heart chronic passive congestion of the liver with central cyanosis and cyanotic induration of the spleen and kidneys edema in the right upper pulmonary lobe healed tuberculous scars in the left upper pulmonary lobe acute swelling of the retroperitoneal lymph-glands cholelithiasis subcutaneous dermoid cyst in the midline of the neck anteriorly Meckel's diverticulum fibrous adhesions between the omentum and a left hydrosalpinx. In addition, there was a moderate stenosis of the aorta which was probably luetic in origin, since the patient's blood gave a strongly positive Wassermann reaction.

To return to the case immediately under discussion, a diagnosis as to the exact nature of the contents of these pelvic masses can always be made in a very simple way. For a long time when there has been any doubt in my mind as to the nature of such masses particularly where it is important to avoid abdominal operation it has been my custom to do an exploratory colpotomy. In many cases this is not necessary as in this instance since this patient is afebrile, and even if we had opened into pus there would be no particular contraindication to the latter operation. But were this patient febrile and hence not in the

best condition for abdominal section, I would make an incision through the posterior vaginal wall and drain the pelvis first from below. Two of the cases just cited were treated in this manner in one the colpotomy being performed immediately prior to the abdominal section and in the other three days prior. If pus escapes, drainage is effected and the laparotomy may be undertaken as soon as it appears wise. If blood escapes, laparotomy may be carried on at once or subsequently according to the patient's condition, the only danger being that in promoting an evacuation of clotted blood from the pelvis there is a possibility that renewed hemorrhage might take place. This, however I do not regard as a considerable danger. Inasmuch then as this patient has been afebrile during her time in the hospital, we will proceed to a laparotomy.

Upon opening the abdomen the uterus is seen to be elevated with the bladder into the false pelvis and adherent posteriorly to the mass filling the pelvis. The right tube is free and slightly injected, thickened and kinked, but patent. The right ovary is normal and free. The mass filling the pelvis on the left side consists first of all of an upper portion representing the left tube and enlarged to 8 cm. in diameter and containing a hematoma. It is densely adherent between the pelvic wall and the uterus while the sigmoid flexure is adherent over it posteriorly and above. Below this there is another mass of quite the same size. This is densely adherent to the pelvic wall, and upon being freed it proves to be the left ovary. Owing to the density of the adhesions and difficulty in freeing this second mass it has ruptured and pus escapes from it. The rectum has walled this lower mass off fairly well from the right side of the pelvis. The anterior cul-de-sac is free and two small subserous fibroids are found presenting in the uterine fundus.

The question of dealing with these structures now presents itself. It is obvious that the entire left appendage must be extirpated. The question of the extent to which operation may be carried in cases of tubal pregnancy must be determined as in everything else in surgery by the condition of the patient. In tubal pregnancy where there has been a recent rupture or

abortion with a considerable escape of blood, so that the patient is in a state of acute anemia, and particularly if she shows any degree of shock, operative procedure must be limited to the sheerest necessity and it must not be forgotten that the fundamental surgical procedure in hemorrhage is to reach the bleeding point and stop the escape of blood. This is particularly applicable to an ectopic pregnancy where the patient is plainly in grave condition. In a case such as this present one, however where the hemorrhage has taken place some time prior—often weeks—and where the patient's condition is not worse than were she suffering simply from an old, chronic left salpingo-ovariitis or from simple uterine fibroids, the operation may be as extensive as the pathology of all the tissues taken together warrants. Hence, inasmuch as we have here a uterus that contains fibroids, it would be better to treat this case not only by extirpation of the pregnant tube and of the abscessed ovary but of the uterus as well. With the left tube and ovary freed, ligated off and cut, the next ligature takes in the uterine artery on the left side. This is cut away. On the right side we will remove the tube only and leave the ovary since that is quite normal and the patient's age warrants ovarian conservation. The technic in detail of hysterectomy has been described in a previous clinic. By this time we have arrived at the anterior culdesac, and the question now comes up whether the hysterectomy should be a subtotal or a total one. There are those who argue that in performing a hysterectomy the cervix should always be removed, owing to the fact that subsequent disease has been known to take place in the cervical stump. Just at this time I am somewhat strongly inclined to this view because I have in my ward down stairs a patient who was operated upon in 1900—twenty two years ago in this hospital—for a fibroid of the uterus by subtotal hysterectomy. She is now dying of extensive inoperable carcinoma involving the vagina and bladder and probably arising in this cervical stump. On the other hand there are occasions where it is plainly not necessary to remove the cervix. It has been my custom in performing

best condition for abdominal section, I would make an incision through the posterior vaginal wall and drain the pelvis first from below. Two of the cases just cited were treated in this manner in one the colpotomy being performed immediately prior to the abdominal section and in the other three days prior. If pus escapes drainage is effected and the laparotomy may be undertaken as soon as it appears wise. If blood escapes, laparotomy may be carried on at once or subsequently according to the patient's condition the only danger being that in promoting an evacuation of clotted blood from the pelvis there is a possibility that renewed hemorrhage might take place. This, however I do not regard as a considerable danger. Inasmuch then as this patient has been afebrile during her time in the hospital, we will proceed to a laparotomy.

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block off the lower pelvis from the upper clean structures. This method has been described previously in one of these clinics.¹

While the abdominal wall is being closed I will examine the gross specimen. The uterus is seen to be slightly thickened throughout its wall soft, and doughy. The mucosa is thin showing that a decidua has already been cast off. The decidua is rarely present in a uterus after bleeding has gone on for any length of time in ectopic gestation. In the anterior fundal wall we find two fibrous growths, each approximately 1 cm. in diameter and in the posterior fundal wall one subserous growth about the same size. The cavity is approximately 2½ inches deep and the cervix shows the lacerations described with several small cystic developments the so-called Nabothian follicles. The right tube is slightly injected and slightly kinked but is patent at the fimbriated end. The left tube contains in its lumen a swelling approximately 6 cm. in diameter the upper margin of which is seen to be eroded. Upon splitting this open the mass is revealed as a hematoma with a cyst-like center 1 cm. in diameter in which we find a macerated embryo proving grossly that the case is one of pregnancy. Adherent below this mass is a left ovarian abscess of about the same size.

From the appearance of this specimen the case would ordinarily be classed as a ruptured tubal pregnancy. Insofar as the tube wall has been destroyed, and hence there has been an accumulation of free blood in the pelvis this is a pregnancy of that type. We should regard this accident to tubal pregnancy as due rather to the erosion of the structure of the tube wall by the active infiltration on the part of the trophoblastic cells rather than as a splitting or rupture due to distention. The chances are that the tubal wall seldom gives way as a result of distention. Otherwise such a thing as tubal pregnancy going on to the later months of pregnancy or to term could not happen. What actually happens in tubal pregnancy is this. There being a relatively poor decidual reaction in the tube there is no well-developed decidual membrane, such as occurs in normal uterine pregnancy to receive the infiltrating tropho-

hysterectomy to remove the cervix where the cervix itself shows any pathology either that due to infiltration, hypertrophy or erosion, and particularly where it has been traumatized by labor. That is the circumstance in this case. The cervix was described as having been split to the left and gaping into the vagina a cervix that should not under any circumstances be left in its present state. Therefore this uterus will be removed in its entirety. Where, however the cervix does not show disease and where it has not been damaged by labor it may be safely left. This is particularly advisable where the hysterectomy is more than ordinarily difficult, as in operating upon very obese patients, or where the patient's condition is such as to require more than ordinary haste. The objection to total hysterectomy that is at times made, that the vagina is shortened, need not give concern provided in closing the vaginal vault the round ligaments are securely stitched into it. Formerly I closed the vaginal vault first and then secured the round ligaments over this line of suture. For the last three or four years I have been stitching the round ligaments directly into the vaginal vault in closing the wound, as is done in this case. This is somewhat simpler saves a little time and has not been followed by any evidence of postoperative ascending infection. Where drainage is desired, where each ligament is stitched into its respective vaginal angle the intervening space is left open so that gauze or rubber tissue drainage can be placed, leading down through the vagina. In this case drainage will not be established inasmuch as the pus in the ovarian abscess is undoubtedly sterile and the patient is afebrile, there being no leukocytosis and no evidence of acute reaction in the pelvis. Another advantage in stitching the round ligaments into the vaginal vault is that the lateral peritoneal surfaces are brought well down into the true pelvis and thus peritonization of the raw surfaces is begun. There is now left the raw pouch of Douglas posteriorly with a clean anterior cul-de-sac, the vesical peritoneum being still loose. In order to close over this raw pelvis I will now cover it by a sigmoid-rectal closure using the sigmoid flexure and rectum with running catgut stitch to entirely

dibulum, where the lumen of the tube is so much wider any ensuing hemorrhage would at once flow out through the tube into the pelvis. During this past year I have had 2 cases of tubal pregnancy in both of which there was considerable clotted blood in the pelvis, one forming a mass the size of a grapefruit and the other not larger than a lemon. In each of these the tube was absolutely undamaged through its entire length, the fimbriated end being merely embedded in the blood-clot. In neither case was there any gross material proving pregnancy but in both cases the small portion of tissue removed from the fimbriated extremity showed chorionic villi on microscopic section.

Here we have another end result of tubal pregnancy that is ordinarily not thought of the development of a hematoma without anatomic destruction or extensive damage to the tube itself where the hemorrhage spontaneously ceases and where if left alone the hematoma would become resorbed and the patient be spontaneously cured. In operation it is sufficient in cases such as this to remove the clotted blood alone.

The case here presented together with those cited, illustrates another important point in the clinical aspect of ectopic gestation, that is, that relatively few of these patients develop the crises so dramatically described in the text books as characteristic of this condition. In my own series not more than 1 in 15 of these patients showed shock or in any way a dangerous condition at the time of their admission to the hospital. Not more than one in fifteen, in other words, are emergencies. It is true that we do see the woman who is brought in with the abdomen and pelvis full of free blood, who is in shock and collapse in a condition of grave emergency—and there is no graver emergency than that of an actively bleeding ectopic pregnancy when it does occur. But in the great majority of ectopic pregnancies—at least in my experience this is not seen. The history as exhibited by the patient here presented is rather characteristic of nearly all of them. It is in these cases rather than in the emergencies that the diagnosis is most often missed. Too often the physician thinks unless his patient is in shock and collapse he

blast as the ovum embeds and to protect the maternal tissues from this infiltration. In uterine pregnancy the decidua is so thick that the trophoblastic cells are unable to penetrate into the uterine wall and permit chorionic villi to develop there. In tubal pregnancy there being no such protection to the maternal tissues, the wall of the tube is penetrated, and not only the trophoblast but the chorionic villi are able to go entirely through it. Again, in uterine pregnancy the decidua membrane contains only capillaries. These are opened up by the trophoblastic cells and occupied by them, only sufficient blood escaping to form the intervillous circulation. It is probable that trophoblastic cell should never reach an artery or vein. In tubal pregnancy this, again, is not the case. The trophoblast is able to attack the arterioles and veins and in opening them up releases more blood than the chorionic layer itself can control. This blood coagulates about the ectopic gestation sac, which then undergoes necrosis. Now if this hemorrhage occurs coincidently with the erosion of the tube wall, blood escapes into the peritoneal cavity and this is called ruptured ectopic pregnancy. If it is a hemorrhage without erosion of the tube wall the hematoma which forms is retained within the tubal lumen or if not retained the fluid portion of it runs out through the fimbriated end again forming a pelvic hematocele and in either circumstance it is called tubal abortion. As a matter of fact, the word abortion here is also poorly employed, since this process is not in any way comparable to what we ordinarily mean by abortion with reference to uterine pregnancy. The idea that the gestation sac may be aborted from the tube by being carried through its lumen and expelled either through the uterine or abdominal end is, in all probability, incorrect. We have all seen specimens of tubal pregnancy where the hematoma including of course the gestation sac has been found projecting from the abdominal end. This is as nearly a tubal abortion in the proper sense of that term as ever happens, and yet it represents most probably an implantation of the gestation sac into the infundibular tissue. It can be readily understood of course that if the ovum should implant in the infun-

CLINIC OF DRS ARTHUR DEAN BEVAN AND JAMES C. GILL

PRESBYTERIAN HOSPITAL

ENDOTHELIOMA OF THE SPINAL CORD

Patient with Tumor of the Spinal Cord. Neurologic Findings by Dr GILL. Operation. After-history

A Second Patient with Tumor of the Spinal Cord Presenting Bladder Symptoms. Findings by Drs. Herbst and Bassoe.

A Third Patient on Whom an Operation for Tumor of the Spinal Cord Had Been Performed Some Ten Years Previous.

DR BEVAN This morning I am going to give a joint clinic with my colleague of the Neurological Department, Dr Gill.

The patient is a young woman upon whom Dr Gill has made a diagnosis of tumor of the spinal cord. Dr Gill will first present to you quite fully the history of the patient, the general clinical picture, the evidence upon which he has made the diagnosis of spinal cord tumor and will attempt to locate as accurately as possible the position of the tumor. I shall then do a laminectomy and expose the section of the cord in which Dr Gill believes the tumor lies, and attempt to find and, if possible, remove the growth.

DR. GILL Tumors involving the spinal cord occur with sufficient frequency to warrant careful consideration as to the possibility of a surgical procedure for the removal of the tumor and the relief of the symptoms.

The following case is of interest. Miss S age thirty-one entered the Presbyterian Hospital on the service of Dr Sippy December 27 1921. Because of symptoms indicating some involvement of the nervous system I was asked to see the case.

should not consider an ectopic pregnancy. On the contrary wherever he has a pelvic mass he should consider ectopic pregnancy whether the patient has a preceding history of amenorrhea or not or indeed, whether she has given a history of extensive or too frequent bleeding or not. We have then, ectopic pregnancy without preceding amenorrhea, and I have had one case of tubal pregnancy with extensive pelvic hematocele where the patient had had no menstrual irregularity whatever and had had no extensive bleeding subsequent to the probable time of tubal rupture. Even in the absence of extensive mass formation in the pelvis tubal pregnancy must be considered, because the diagnosis may be made even prior to the so-called rupture or abortion. Here it would be based rather upon the appearance of a small swelling on one side or the other with probably a short period of amenorrhea and without metrorrhagia. The character of the pain, too is often misleading. After the hematocele has been developed to any extent it is apt to be one of pressure fulness in the pelvis with more or less short, cutting, stabbing pains low down in the abdomen, but many of these patients speak of the pain as if it were *indefinite* in origin, sharp cramp-like and cutting and if associated with nausea and vomiting as it not infrequently is, they are apt to regard it as an attack of indigestion. Particularly if the cramps are lateral instead of median and if the patient presents symptoms indicating threatened, imminent, or incomplet abortion, should ectopic pregnancy be held in mind. Finally the passing of a decidua cast from the uterus is emphasized as an important sign by all writers. This cannot be controverted, but, as a matter of fact, this cast is rarely seen either by the physician or the patient. *In nearly every case it is lost by the time the patient appears for treatment.*

Sensations—Pain and temperature sense diminished equally on both legs most below knees. Tactile sensation present on both lower extremities but diminished below knees. Muscle sense markedly diminished on left lower extremity normal on right side. Pressure over the first and second lumbar vertebrae produces pain, to which I attach no importance. Romberg present to a considerable degree. Upper extremities and trunk above the tenth dorsal segment normal. A narrow zone of hyperesthesia exists in region of tenth dorsal segment.

Bladder—Not disturbed except for some slight inability to empty readily at all times.

Bowels—Normal except for constipation.

Motor Power—Flexors of knees stronger on right side than on left. Flexors and extensors of toes stronger on right side than on left.

Gait—Patient walks with a shuffling spastic gait, more pronounced in the left leg than in the right.

Spines—x Ray of spine negative. Laboratory examination of spinal fluid negative except Nonne shows 1+.

Diagnosis.—A clinical diagnosis was made of an intradural tumor on the left side of the cord located at the level of the tenth dorsal vertebra. Nature of the tumor problematic. The diagnosis is based upon the history of a persistent pain localized along the distribution of the twelfth dorsal segment on the left side worse at times, but never disappearing entirely the disturbance of pain and temperature sense on both lower extremities spasticity exaggerated reflexes, positive Babinski, ankle-clonus on both sides but more marked on the right. A combination of such symptoms would indicate that there was interference with the functions of the ascending Gower tracts in both hemispheres of the cord pressure on the cross pyramidal tract in both hemispheres, but more pronounced on the left side interference with the direct cerebellar tracts carrying impulses of muscle and joint sense on the left side.

Differentiation must be made from other disorders which might present many of the symptoms shown in this case.

Involvement of the vertebrae from caries syphilitic exostoses,

Patient complained of pain in left side of abdomen and difficulty in walking. The pain began about eight months ago. At first it was not very severe and did not cause much anxiety. Gradually it has increased in severity until the patient consulted a physician because she thought it was due to some abdominal condition. The pain is always located in the left side, extending from the middle of the left part of the back in the lumbar region, around the side and on to the abdomen as far forward as the midline and in a zone about 4 inches wide. It is constant, but more pronounced at times seemingly worse at night. Movements involving the bending of the back increase the pain. The pain is usually of a dull aching nature but sometimes becomes cramp-like.

Difficulty in walking was not noticed until about two months ago but patient says it may have been present longer since she thought at first that it was rheumatism or stiffness from over work etc. During last few weeks it has become greatly aggravated until at the present time she walks with great difficulty.

Family history negative.

Past illnesses.—Nothing of importance except the fact that the patient was confined to the Elgin State Hospital for the Insane for a period of about six months during 1919 suffering from an attack of manic-depressive type of insanity which had no bearing upon her present condition.

Examination.—Shows a well-developed female both sides of the body symmetric. There is no apparent atrophy of the muscles of the body.

Reflexes.—*Lower Extremities*—Both knee jerks exaggerated, ankle-clonus present on both sides. Positive Babinski both sides. All reflexes are more pronounced on the left than on the right side.

Upper Extremities—Tendon reflexes present and equal on the two sides.

Abdominal reflexes present on right side absent on left.

Eyes.—Pupils react to light and accommodation normally. No nystagmus. All movements of eyes normal. All cranial nerves apparently normal.

usually by pressure upon the anterior motor roots producing atrophy of some of the muscles prior to sensory disturbances.

± Ray pictures of the vertebrae sometimes aid in the early diagnosis of caries.

We have examined the patient carefully and fail to find any evidence of a primary tuberculosis or any symptoms that would indicate caries. Syphilitic exostoses may be excluded by the

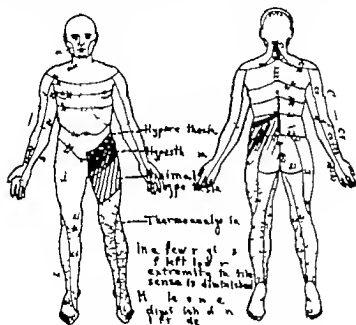


Fig. 281.—Chart II of Dr. Gall's case of spinal cord tumor.

absence of any syphilitic history and the negative results of the examination of the cerebrospinal fluid. Carcinoma of the vertebrae is usually secondary to a primary carcinoma in some other part of the body but when present may produce symptoms somewhat similar to tuberculous caries and the differential points would be practically the same. Osteomyelitis of the vertebrae is rare, but may produce symptoms such as described in this case.

Involvement of the cord itself and its coverings in conditions

carcinoma, and osteomyelitis must be considered. Caries, which is usually tuberculous and invariably secondary to some tuberculous process in other parts of the body might present many of the symptoms as given in the case under consideration, differing in this respect, that following the bone involvement there is an accumulation of a purulent, cheesy material between the bone and the dura, with compression of the cord and the an-

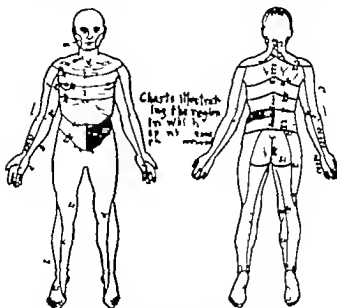


Fig. 280.—Chart I of Dr. Gill's case of spinal cord tumor

terior motor roots producing symptoms of atrophy in some of the muscles of the body and spasticity before any sensory symptoms occur

Differential points would be age of patient, caries, as a rule coming on earlier in life accompanied by stiffness of the back, pain upon pressure over the vertebrae pain from jarring of the spine and the fact that early symptoms of cord pressure from the products of tuberculous involvement manifest themselves

usually by pressure upon the anterior motor roots producing atrophy of some of the muscles prior to sensory disturbances.

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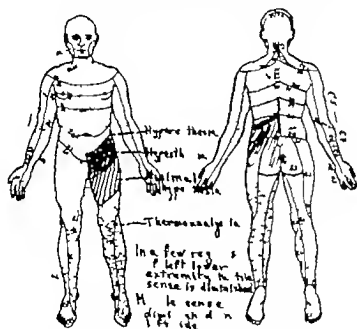


Fig. 281—Chart II of Dr. Gill case of spinal cord tumor

absence of any syphilitic history and the negative results of the examination of the cerebrospinal fluid. Carcinoma of the vertebrae is usually secondary to a primary carcinoma in some other part of the body but when present may produce symptoms somewhat similar to tuberculous caries, and the differential points would be practically the same. Osteomyelitis of the vertebrae is rare, but may produce symptoms such as described in this case.

Involvement of the cord itself and its coverings in conditions

other than tumors must be considered. The various types of subacute and chronic myelitis, such as lateral sclerosis, ataxic paraplegia, or combined sclerosis, may present a combination of symptoms suggestive of tumor. The etiologic factors in the development of such conditions such as acute infectious diseases, focal infections, syphilis, spinal cord changes of pernicious anemia, arteriosclerosis, can all be excluded in the present case. Multiple sclerosis, with its symptoms irregularly distributed throughout the central nervous system, frequently accompanied by nystagmus and optic nerve changes, speech disturbances and occasional intention tremor certainly would not be confused with the symptoms of cord tumor. Pachymeningitis cervicalis hypertrophica presents a group of symptoms that may give some difficulty in differentiation.

Remembering that the above disorder is located usually in the cervical region of the cord, which rarely is the seat of tumors, that pachymeningitis often progresses more rapidly and is frequently preceded by syphilis, the differentiation usually will be made without difficulty.

Syringomyelia in its early manifestations may present symptoms as given in the present case, but the characteristic symptoms of this disorder namely the dissociation of sensation, often makes its appearance quite early and would be an important factor in the diagnosis.

Intradural tumors may be differentiated frequently from intramedullary by noting the fact that the symptoms as in the present case indicative of an intradural tumor first produced pain which was continuous in character and confined to one segment of the cord. The intramedullary tumors on the other hand show tendency to extend to other segments of the cord sooner or later and the symptoms would be shifting in character. In intramedullary tumors the pain is not as pronounced a symptom as in intradural tumors.

Location of the Tumor—The tumor may be located with a fair degree of accuracy by remembering the skin areas supplied by the various cord segments. Complete anesthesia in skin areas supplied by certain segments not looked for as the cutaneous

sensory fibers in any given area may extend to two or three segments. Tenderness over the vertebrae is not a reliable guide in locating the tumor. The position of the spontaneous, persistent pain along the distribution of the twelfth dorsal segment seemed to warrant locating the tumor opposite the body of the ninth dorsal vertebra.

Treatment.—Excluding the gummas we cannot hope to benefit the patient materially by medicinal treatment and surgery is the only hope for relief in this case. In the hands of an experienced, skilful operator many cases have been materially improved and frequently complete cures established. I have asked Dr. Bevan to operate this case and feel sure that in his hands the case will be given every possibility of relief from her distressing symptoms.

DR. BEVAN. Dr. Gill has located for us the tumor opposite the eleventh dorsal vertebra, more on the left side than upon the right. After hearing his very clear discussion of the case I quite agree with him that the chances are distinctly in favor of the symptoms in this girl's case being due to the pressure of the spinal cord tumor and that it is clearly our duty to make a laminectomy and expose that area of the cord.

The patient is now anesthetized. Dr. Herb has used ether in this case, and the patient, as you see, is lying upon the abdomen so that we can readily expose the lower dorsal vertebrae. I now make an incision from the twelfth dorsal spine upward for a distance of about 6 inches (Fig. 282). I cut down to the tips of the spinous processes from about the eighth to the twelfth dorsal vertebrae. I now take a rather broad, moderately sharp chisel, and with this instrument separate the soft tissues, muscles and small tendons from the posterior surfaces of the arches. There is, as you will notice, considerable hemorrhage in doing this. I pack the groove thus exposed very tightly with gauze so as to control the bleeding. I then have the two assistants hold the edges of the incision well apart. I might use here a self-retaining retractor but on the whole I rather prefer retractors in the hands of the assistants. I use a very strong pair of rongeur for

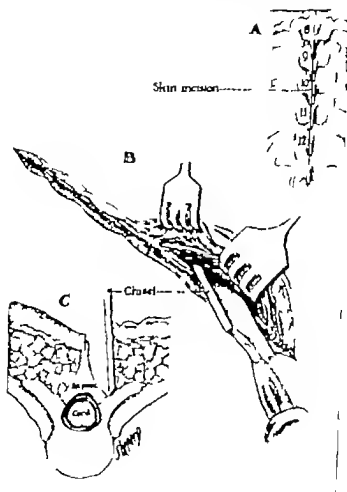


Fig. 282.—Case I. A Midline incision. B and C Musculature separated from laminae.

ceps and bite off first the spinous processes of the twelfth, eleventh, tenth and ninth dorsal vertebrae. You will notice that I continue packing the wound tightly with gauze so as to

control the bleeding wherever I can. I do not attempt to control it by ligating any vessels. I now begin with the strong rongeur forceps and bite off the arches of the vertebrae. In doing this in several places you will notice that we have very free bleeding from the bone and I control this with a piece of Horsley's wax, the same wax that you have seen me use so frequently in operations on the skull. The process of removing these arches with the rongeur forceps is rather tedious and yet I think it is safer than removing them with the chisel, and I prefer it on account of its greater safety. I have now exposed the cord from the twelfth to the eighth dorsal vertebrae. You will notice that after removing the arches the cord is surrounded with a thin layer of fat and veins, called the meningeoarchidian plexus of veins which is outside the dura.

As I look at the cord covered by the dura I see nothing abnormal, and as I very gently run my fingers over it I am not sure that I feel anything abnormal. I now split the dura and allow a very considerable amount of cerebrospinal fluid to escape. This comes out, when I first made the puncture in the dura, in a little stream with enough pressure to spurt out 3 or 4 inches above the opening. This however is simply momentary and when the pressure is relieved the cerebrospinal fluid simply gently flows out, wetting the field. As I expose the cord outside of the eleventh dorsal vertebra I see no tumor but as I split the dura up over the tenth I see very distinctly the lower margin of a well-outlined neoplasm occupying the left side of the spinal cord (Fig. 283). This is about the size of an ordinary cranberry and compromises very materially the cord because of its pressure. The tumor has the appearance of an endothelioma. It seems to spring from the pia. Several of the posterior roots of the spinal nerves cross the tumor. It is not extremely vascular. It is rather brownish-red in color and is so distinctly separated from the cord itself that we can find a line of cleavage and can separate it from the cord and two of the posterior roots without apparently doing any serious injury to the structures. In doing this part of the operation you will notice that I take some small pledgets of cotton wet in normal salt solution which are grasped with

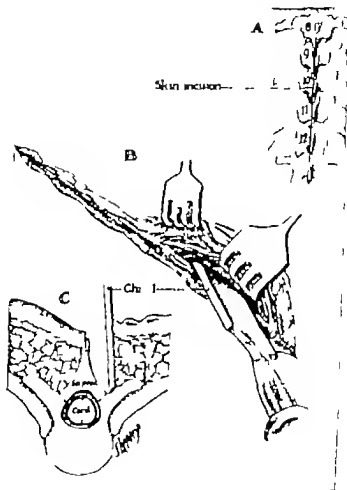


Fig 232.—Case I. *A* Midline incision. *B* and *C* Musculature separated from laminae.

ceps and bite off first the spinous processes of the twelfth, eleventh, tenth, and ninth dorsal vertebrae. You will notice that I continue packing the wound tightly with gauze so as to

all of the tumor possibly nine tenths of the circumference in this way I now pick up the tumor mass with some fine dissecting forceps without teeth, and am able to lift it out and gently tease it away from the cord without producing any hemorrhage and without apparently producing any injury of the cord. The blood

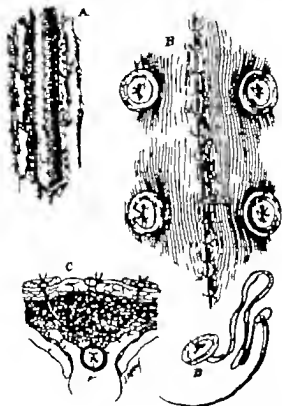


Fig. 284.—Case 1. *A* Closure of dura. *B* Button sutures in place skin closed. *C* Cross-section of *B*. *D* Button suture and needle.

ing from the laminectomy incision has not entirely been controlled so I shall pack the edges with some sterile absorbent cotton pretty firmly and at one place use a little more Horsley's wax, stopping some bleeding from the bone as I am very desirous of having a perfectly dry field when I complete my closure.



Fig. 283.—Case 1. *A* Removal of laminae. *B* Dorsal opening and tumor exposed. *C* Tumor removed with wet cotton pledget.

some small mosquito forceps, and the process is rather that of very gently wiping off the tumor from the cord than anything in the way of a definite dissection. As I have separated almost

all of the tumor possibly nine-tenths of the circumference in this way I now pick up the tumor mass with some fine dissecting forceps without teeth, and am able to lift it out and gently tense it away from the cord without producing any hemorrhage and without apparently producing any injury of the cord. The blood

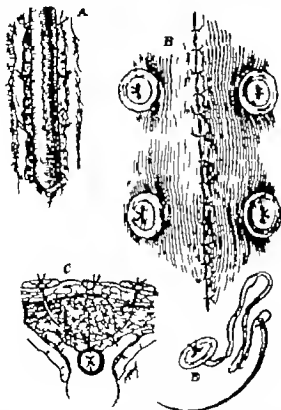


Fig. 281.—Case I. A Closure of dura. B Briston sutures in place skin closed. C Cross-section of B. D Bottom suture and needle.

ing from the laminectomy incision has not entirely been controlled, so I shall pack the edges with some sterile absorbent cotton pretty firmly and at one place use a little more Horsley's wax, stopping some bleeding from the bone as I am very desirous of having a perfectly dry field when I complete my closure.

With very fine catgut I now sew up the incision in the dura mater. By this time the hemorrhage is entirely controlled and I close the incision in the soft parts. I am using, as you see, a method which I believe is quite efficient. I am using tension button sutures passing through the skin and superficial fascia and the muscles, so that when these two sets of tension sutures are tied the dead space produced by the removal of the arches is practically entirely obliterated so much so that I do not intend to use any drainage in this case (Fig. 284). Frequently in these cases I have left in a little piece of rubber tissue for forty-eight hours to provide for the escape of cerebrospinal fluid, blood, and primary wound secretion. The field here is so dry that I shall treat it as a clean hernia or appendix incision and dispense with drainage entirely.

The patient is in very good condition at the close of the operation, and I am very much in the hope that it will be one of a group of successful cases both from the standpoint of the operative recovery and that the character of the growth will be such that there will be no recurrence, in other words, that it will prove histologically to be benign and not malignant.

After-history—The patient made a very good recovery. She complained rather bitterly of headaches for several days after the operation. I have had this same experience in a number of laminectomies where we have opened the dura and allowed the cerebrospinal fluid to escape. The same thing is experienced sometimes in using spinal anesthesia. Just what causes these headaches is difficult to explain. They are associated in some way evidently with interference with the cerebrospinal fluid and with brain and cord tension. Most of them are transitory. Some of them however are very persistent and are followed by a train of symptoms which might be classified as aseptic meningitis from which the patient usually recovers completely. In this patient case the headaches lasted for several days and then disappeared. She was then surprised and delighted to find that the pain in the left side from which she had complained before operation had almost entirely disappeared and within a few days this had gone completely. Immediately after the opera-

tion the patient had little or no use of the left limb and but slight use of the right. Within a few days, however the function of the right returned and within a week it had practically completely returned and within two weeks the patient had very fair motion in the left leg. I kept her in bed for a couple of weeks and then got her up in a wheel chair and as the function of the left leg returned, gradually got her about on crutches until now three months after operation, she is walking fairly well, improving gradually but surely and I hope will go on to complete recovery.

The microscopic examination of the specimen shows that it was an endothelium of a benign type and from that we can hope that there will be no recurrence in this case.

DR GILL Patient was operated on January 12th. Left the hospital markedly improved on February 28th since which time I have seen her on several different occasions, each time noting continued improvement.

I saw her last on April 24th. At that time she was able to walk without assistance the area of pain on the left side had disappeared entirely and the only reminder she had of the original trouble is an exaggerated knee-jerk on the left side with some slight limp as she walks.

The improvement has been so rapid and pronounced that I feel we are justified in saying that the patient will be restored to normal.

DR BEVAN I am fortunate in being able to show you this morning another spinal cord tumor a case which was operated upon some weeks ago. This patient, a man of forty came first under the observation of my colleague Dr Robert H. Herbst, of our Urological Department, with bladder symptoms, difficulty in urination, and the case was at first looked upon as being one of a possible prostatic obstruction. In going over the case however it was noticed that he had in addition to difficulty in emptying the bladder a paresis of both extremities. He walked with great difficulty and these symptoms became worse so that within a short time he could not walk at all. Dr Bassoe our neuro-

logic colleague, was called into consultation, and going over the case the conclusion was arrived at that he had a tumor of the spinal cord. The consultants Dr. Bassoe, Dr. Herbst, and myself agreed that the wisest procedure would be to first do a laminectomy and explore the cord with the hope of finding the tumor and remove this if it were possible to do so. I shall ask Dr. Herbst to give you the urologic aspects of the case.

DR. HERBST This patient, who is fifty-two years of age entered the hospital complaining of inability to urinate and paralysis of the left leg.

Past History—He states that he was in good health until one year ago when he noticed disturbance in sensation on the right side especially the right leg which he describes as a loss of feeling or numbness. One month after the onset of these symptoms he noticed that the left foot began to drag along the ground when walking. About four months ago he began to have difficulty in voiding urine. This was accompanied by frequency both diurnal and nocturnal. He states that he has been compelled to urinate every half hour. During the last two weeks he has not been able to void successfully until he could feel his bladder as a mass above the pubis. For the last eighteen hours he has not been able to pass any urine.

Physical Examination.—A poorly nourished man who appears acutely ill, with a marked distention of the bladder evidenced by a symmetric suprapubic tumor which extends to the umbilicus.

The prostatic gland is slightly enlarged, smooth, soft, and symmetric. The seminal vesicles are palpable.

A. N. 20 Wharfed catheter passes into the bladder without difficulty obtaining 880 c.c. of urine.

Laboratory Findings.—The urine contains many pus-cells (2500 to the field) few red cells, a trace of albumin, but is otherwise negative.

Both blood and spinal fluid Wassermanns are negative. Rouse negative.

Cystoscopic Examination.—The bladder is greatly dilated. There is a marked degree of trabeculation and the wall is covered

by a fringe like necrotic membrane. There is a slight projection of prostate into the bladder the left lateral and middle lobes being the larger

Discussion.—It is evident from these findings that the retention of urine in this case is not due to obstruction. Although the prostate gland is slightly enlarged, it is not sufficient to produce the marked retention found in this patient. A disturbance of urinary function, either partial or complete, is frequently an early sign found in spinal cord lesions such as tabes cord tumors etc. In some instances, even before the patient shows any other signs or symptoms, one may see changes in the bladder wall which are diagnostic of nerve injury or disease.

Etiologically there are two types of retention of urine

1 Obstructive.

2 Retention due to paresis or inco-ordination of the bladder muscles.

Our patient's retention belongs to the latter type and is probably caused by a lesion of the spinal cord. Therefore we will refer him to Dr. Bassoe for neurologic study

Later History—During convalescence following the removal of the cord tumor the bladder has been drained by an indwelling catheter and cleansed with boric acid solution morning and night. The indwelling catheter was not well tolerated and repeated catheterization with argyrol instillation was substituted.

It is now four weeks since the cord tumor was removed. The patient complains of pain in the lower abdomen and has developed an afternoon temperature ranging from 101° to 102° F. You will note a suprapubic swelling which is extremely tender and does not disappear on emptying the bladder. This is evidently a pericystitis due to infection which has spread from the bladder into the prevesical space.

Cystotomy with drainage of the bladder and prevesical space is indicated

Operation.—I will infiltrate the abdominal wall with $\frac{1}{2}$ per cent. novocain solution, beginning in the midline at the pubis and extending t within 4 cm. of the umbilicus.

I will now make a 3-inch incision, dividing the fascia and

separating the recti. You will note that the prevesical space is infiltrated and you can see a seropurulent fluid oozing from it. The peritoneum is adherent rather low down on the anterior wall of the bladder. Using care and gentle blunt dissection, I have succeeded in pushing the peritoneum up and exposing the anterior bladder wall. I will now infiltrate with novocain solution and make a 3 cm. opening into the bladder. The bladder wall is greatly thickened; this is due to infiltration and hypertrophy of the muscular wall. I will insert a No. 40 drainage-tube into the bladder and a small cigarette drain into the prevesical space.

By means of a through-and-through silkworm-gut suture which includes the upper angle of the bladder incision, I will suspend the anterior wall of the bladder. This suture prevents leakage of urine around the tube.

I will close the wound in the usual manner, fixing the tube to the skin with one silkworm-gut suture.

Subsequent Course.—After five days the tube was removed and a No. 20 dePezzar catheter substituted. This was changed and the bladder irrigated every three days for six weeks, when it was removed and the fistula allowed to close.

Postscript.—Eight months after the operation the patient has gained in weight. The urine is quite clear. The bladder function has not been entirely restored, as he still carries a small quantity of residual urine.

DR. BEVAN: Dr. Bassoe will give you the neurologic diagnosis.

Neurologic Examination by Dr. Peter Bassoe on May 7, 1921.—The pupils are normal and there is no cranial nerve affection. The reflexes in the arms are normal. No abdominal reflex is obtained except in the left upper quadrant where it is weak. The cremaster reflexes are weak, more so on the left side. The knee and ankle reflexes are exaggerated, particularly on the left side, where clonus is present. A Babinski sign is not obtained. (The Babinski sign had been positive on the left side a few days previously and was again obtained three days later.)

Beever's umbilicus sign is present. When the patient attempts to raise his body with the arms folded on the chest the umbilicus moves upward about an inch, and the upper abdominal muscles can be seen to contract while the lower ones are ballooned outward. The strength in the right leg is good. The extensors of the left foot and knee are very weak and the flexors of the foot are considerably weakened, while those of the knee are good. All left hip movements are decidedly weak. Tactile sensation is impaired below the level of the umbilicus especially in the distribution of the three lower thoracic and two upper lumbar segments while the hypesthesia is less marked in the distribution of the lower lumbar and sacral segments. The temperature sense is lost in practically the entire right lower extremity and on the left side only along the outside of the hip. The rest of the left leg is rather hypersensitive to heat and cold. The pain sense is also more impaired in the right leg than in the left.

Diagnosis.—Compression of the cord more marked on the left side at about the tenth thoracic segment (s s at the level of the eighth thoracic vertebra). In view of the negative spinal fluid tests and the absence of roentgenologic evidence of a bone lesion as the cause of compression it is most likely that a tumor within the spinal canal is causing the compression. Exploratory laminectomy is advised, with removal of the arches of the sixth to the tenth thoracic vertebrae.

DR. BEVAN. Under ether we did a laminectomy in the way we did this morning using the same technic that we employed this morning. We found a tumor situated opposite the vertebra. This was also not found until after we had opened the dura, and was an endothelioma. The tumor was removed in the same way. The patient made a very excellent operative recovery. The paralysis of the bladder however required frequent catheterization and the use of 5-grain doses of urotropin every four hours. In spite of this however the bladder became pretty badly infected, so that Dr. Herbst and I agreed that the best plan would be to do a suprapubic under local and drain the bladder to get rid of the infection. This proved to be an excellent thing. The high tem-

perature which was from the cystitis disappeared very promptly and he was much more comfortable after the suprapubic drainage. For a number of weeks we kept him on a water-bed so as to avoid the development of pressure necrosis and bed-sores. Gradually the paralysis of the lower extremities and the bladder cleared up so that we got him up first on an ordinary mattress and then up in a wheel chair. Slowly the power of the bladder returned so that he could urinate. We then took the suprapubic tube out and allowed the bladder incision to close. He then began to walk, and he has gone on to a very satisfactory recovery in the sense that he is able to get about with the aid of a cane and if the improvement continues he will go on to a pretty complete recovery.

Within the last few weeks there came into my consulting room a woman of about twenty-five upon whom I had operated ten or twelve years ago for a tumor of the spinal cord, and I will refer to the case because it will give you a picture of the result in some of these cases, and also it will make clear to you another class of tumors producing cord pressure. This young woman came first to the service of Dr. Harold Moyer, one of our best known neurologists. Dr. Moyer studied the case very carefully and came to the conclusion that the cord pressure symptoms from which she suffered were due to a tumor pressing on the spinal cord opposite the fourth dorsal vertebra. Briefly the young woman gave symptoms of gradually developing paresis of both extremities, a little more on the left side than on the right. She had at first difficulty in walking, some pain, not very marked. This difficulty increased until finally she was unable to walk at all and barely able to move the lower limbs when in bed. An x-ray picture of the vertebral region showed nothing definite but on general physical examination it was found that the child had a number of exostoses at different points of the skeleton, on the humerus and femur and on the tibia. These were bilateral and in the x-ray they showed definitely that they were bony outgrowths from the normal bone with more or less complete ossification. Because of these multiple exostoses Dr. Moyer's conclusion was that a similar exostosis

was growing within the vertebral canal and pressing on the spinal cord, producing the pressure symptoms which existed. I therefore made a laminectomy and on removal of the arches of the third, fourth, and fifth dorsal vertebrae I came down to a bony tumor about $\frac{1}{2}$ inch long and about $\frac{1}{4}$ inch in diameter. This sprang from a pedicle on the left side of the fourth dorsal vertebra and compromised very materially the cord, because at that portion of the spine the vertebral canal is small.

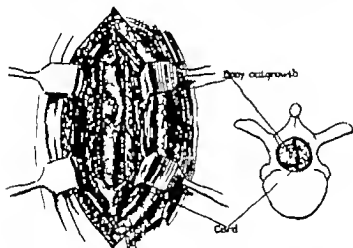


Fig. 285.—Case II. Bony outgrowth from laminae of fourth thoracic vertebra which was chiseled away.

I remember one little incident very distinctly in connection with the case. After exposing the tumor I picked up a chisel and mallet and rather jubilantly said that we were very fortunate in finding conditions which we could so definitely remove and which were clearly benign. I said looking down at the tumor Dr. Moyer we shall be able to chisel this off without any difficulty and then I looked up and found that Dr. Moyer had left the operating room. I thought it was rather singular but went on with the operation and removed the tumor with the chisel which was readily done. Within a few moments Dr. Moyer stepped back into the room and I said "Why Dr. Moyer

I wanted to show you how completely we could remove this tumor. He said, 'Well Bevan, when I saw you pick up that chisel and mallet the thought came to my mind, 'what a terrible thing it would be if the chisel slipped and you cut off the spinal cord, and I simply could not stay in the room while you were doing that part of the operation.'

The girl made a very satisfactory operative recovery but was rather slow in regaining the use of her limbs. This, however she eventually did, so that she can now walk a half-mile or more with, however a rather slow hesitating gait. When she came to see me recently she had developed into a rather large, stout woman was married and able to do her housework, but had gotten rather stout because of lack of exercise and although she can with some difficulty walk a half-mile she had gotten out of the habit of walking and did as little as she could get along with. She has had one child. She is in a condition now where she can get about fairly well, can do almost every thing that an ordinary individual can do and yet even at the end of ten or twelve years she still shows the evidences of the cord pressure. I cite the case to you because of that fact.

The results obtained from operative treatment in tumors of the spinal cord are distinctly more satisfactory than the results obtained from the operative treatment for brain tumors. On the other hand we find in cord tumors a number of the same difficulties. A certain proportion of the cases are malignant.

certain proportion of the cases are of an infiltrating character so that they cannot be removed without great injury to the cord, and in a certain proportion of cases where even by expert neurologists a diagnosis of cord tumor is made exploration fails to disclose neoplasm and shows in many cases degenerative lesions of the cord for which nothing can be done by surgical operation. On the whole however these tumors of the cord furnish us one of the brilliant chapters in modern surgical diagnosis and technic. Many of these patients who are paralyzed and bedridden because of the cord tumor can be cured by removal of the growth. Many of these operations are begun necessarily as exploratory operations. Some of them are unsatis-

factory but a certain number of them are among the most satisfactory cases in the whole range of surgery. With such a conception of the possibilities we should be willing to give many of these doubtful and uncertain cases of paralysis from pressure the benefit of an exploratory laminectomy knowing that there may be only one chance in three or possibly more of finding conditions which can be removed and the patient cured.

CLINIC OF DR. ARTHUR DEAN BEVAN

PRESBYTERIAN HOSPITAL

CARCINOMA OF THE STOMACH: RESECTION BY THE SECOND BILLROTH METHOD

Exploratory Operation on Patient Presenting History and Findings Suggestive of Carcinoma of the Stomach. Resection of Stomach by the Second Billroth Method. Advantages of this Operation.

THE patient upon whom I shall operate this morning is a man of sixty-three who has been under the observation of Dr. Ortmeier. The clinical history is briefly summarized as follows:

He has complained of abdominal distress rather vague in character; he has lost about 20 pounds in weight, lost a good deal of strength, he has no symptoms pointing definitely to his stomach, and the picture has been rather that of distress from the large intestine. In going over the case carefully, however, the examination of the stomach contents showed no free hydrochloric acid. Some occult blood was found in several stools. A Ray examination of the stomach with the fluoroscope and plates showed a definite filling defect at the pyloric end of the stomach. The motor meal also showed definitely a retention, although there had been at no time any vomiting. No tumor could be felt in the abdominal wall. On the basis, however, of the general abdominal distress, occult blood, absence of free hydrochloric acid, and the definite filling defect, Dr. Ortmeier and I both agreed that it would be much wiser to make an exploratory to determine the condition and to do whatever seemed advisable at that time.

We shall employ here a general anesthetic as there are no contraindications, and I prefer to do these exploratories of the

result and of course a fatal termination (Fig 286) I now ligate the gastrohepatic omentum for a distance of 4 or 5 inches in this way freeing the stomach, pylorus and duodenum and mobilizing the mass so that we can proceed with its excision. I now clamp the stomach about $1\frac{1}{2}$ inches behind the lesion, putting on a clamp the blades of which are protected with rubber on the proximal side of the stomach, and putting on a large clamp without rubber protection about $\frac{1}{2}$ inch distal to this. I then divide the stomach at this point, using a knife. We might use a cautery and I fre

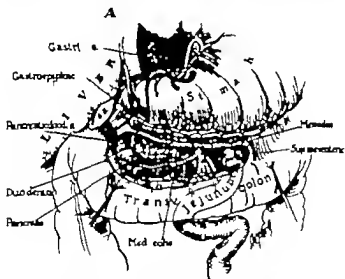


Fig 286.—Diagram showing arterial supply of stomach and transverse colon.

quently use an electric cautery for this purpose. I am not, however at all convinced that the division of the stomach or duodenum with the cautery in preference to the knife has any special advantage. I now close the stomach with three rows of sutures one through the mucosa one through the peritoneum and muscularis and the third a Lembert suture. You will notice that before putting in the last Lembert suture I remove the clamps so as to see whether there is any bleeding. I find a little spurting vessel along the greater curvature which I ligate with

stomach under drop ether wherever the patient is a good surgical risk. Dr. Herb has the patient now under ether. I make an incision from the ensiform to the umbilicus, going a little to the left of the umbilicus as we come down to it. As I open the peritoneal cavity I come at once upon the tumor which is irregular in outline, but, on the whole about as large as an egg, just to the stomach side of the pylorus. This tumor feels hard and firm and I can invaginate the stomach wall with my finger into what seems like a crater ulcer close to the pylorus. The duodenum is quite definitely larger than normal and, fortunately quite free. There are some small glands about the size of beans along the greater curvature and along the lesser curvature. I cannot tell from the examination, even with the mass in my hand, whether it is a callous ulcer or a carcinoma. It is one of those cases, however in which, whether it is a callous ulcer or a carcinoma I feel that we should do a radical operation and resect the lesion. A new chapter is being written at the present time in the treatment of ulcer of the stomach and one of the most interesting parts of the chapter is the conclusion which I have arrived at and which many other surgeons have arrived at, notably Moynihan, von Eiselberg and his former assistant, Haberer. Clement and Schmieden in Frankfurt, is that where we have a large callous ulcer the best treatment is resection by the second Billroth method. Haberer has been doing a number of these by the first Billroth method making a direct anastomosis between the duodenum and stomach. I personally think that the second Billroth method has a much larger field of usefulness and is the operation of choice. In this patient I shall at once proceed to do the second Billroth resection.

I first tear an opening in the thin peritoneum between the greater curvature and the transverse colon then doubly ligate the vessels in the omentum along the lower border of the stomach and the lower border of the duodenum for a distance of about 6-7 inches. In doing this I must be very careful not to ligate the main arterial supply of the transverse colon. If one does ligate the artery supplying the transverse colon he is in great danger of having necrosis of this portion of the bowel as

jejunum down through the opening in the transverse mesocolon and stitch the line of the gastro-enterostomy to this slit in the mesocolon with three or four catgut sutures. I usually in placing these sutures pass them through both the jejunum and stomach

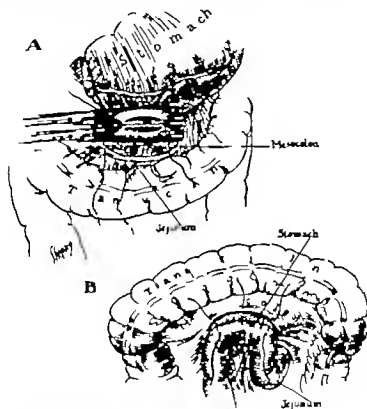


Fig. 287—A Anastomosis of stomach and jejunum above transverse colon. B Sutures of stomach and jejunum to edge of opening in mesocolon from below transverse colon.

wall and then into the mesocolon. Great care of course should be taken in doing this in order to prevent a possible hernia of the jejunum occurring at this opening in the mesocolon. I shall not use any drainage in this case. You will notice that I am clos-

catgut. I now lift up the mass and dissect very carefully the duodenum free for a distance of fully 1 inch or $1\frac{1}{2}$ inches from the pylorus separating it very gently from the pancreas and from the gastrohepatic omentum above and the greater omentum below. I then crush the duodenum just beyond the pylorus with a heavy pair of forceps, and at this line of crushed tissue I ligate the duodenum off with a very strong piece of silk and then cut the bowel between this ligation and the pylorus. I now put a purse-string suture about $\frac{1}{4}$ inch from this point of ligation around the duodenum and invaginate this ligated stump. I then tie the purse-string suture tightly and place a second purse-string suture over the first, but the second one is about $\frac{1}{2}$ inch behind the first. In this way we have now removed the mobilized mass containing a small portion of the duodenum pylorus and about 4 or 5 inches of the pyloric end of the stomach.

Our next problem is to make an anastomosis between the stomach and jejunum. In these cases I have learned that much the most satisfactory technic is to cut open the transverse mesocolon and draw a loop of jejunum through this opening, and make an anastomosis between the stomach and jejunum above the transverse mesocolon (Fig. 287). You see how I do this, using clamps on both the stomach and jejunum and employing three rows of suture. I am still using the Pagenstecher linen and have more confidence in it than I have in catgut. I think, on the whole, it is the best suture to employ in gastro-intestinal work. I am inclined to believe that the argument advanced against the linen and silk sutures, that they are the cause of jejunal ulcer is not very well founded. They may possibly do that in a few cases, but I am inclined to believe our future work will show that these jejunal ulcers occur about as frequently where we use catgut as where we use the non-absorbable sutures; that the essential factor in the production of jejunal ulcer is transformation of the jejunum into what is essentially the first part of the duodenum exposing the jejunum in this way to the corrosive action of the gastric juices, which are beyond question, the most essential factors in the production of peptic ulcer. Now after the gastro-enterostomy is completed I draw the loop of

ulcer In this connection I want to call your attention to a somewhat parallel condition which we have the opportunity of observing more frequently because the lesion is always in sight that is the question of the occurrence of carcinoma in ulcers of the leg Ulcers of the leg are exceedingly common conditions. We know that occasionally a carcinoma does develop in an old leg ulcer or in the scar of an old healed leg ulcer but when we ask ourselves the particular question, How often does a carcinoma develop in these old ulcers? without being able to answer it absolutely from statistics one could without any hesitation say that of the enormous number of leg ulcers that occur in the community very few develop cancer without any question much less than 5 per cent. and probably even less than 1 per cent. I believe the parallel between the leg ulcer and the gastric ulcer which I make is sound. We might admit, of course that more gastric ulcers will change into carcinomas than leg ulcers but at the same time I believe that this change is the exception and that it occurs comparatively infrequently and from my own individual experience I would say without hesitation that I believe I see at least twenty carcinomas of the stomach which have developed independent of any preceding ulcer today where I see one where there is a fair probability that the cancer developed at the site of the old peptic ulcer Certainly the conception that 20 30 40 or 50 per cent. of the cancers of the stomach develop on the site of old ulcers is based upon a misconception and a misinterpretation of facts.

I want to dwell upon this case and tell you that although I believe from the gross evidence this morning that this case is a cancer I would like to make it clear to you that if I had believed that this was a callous ulcer I should have resorted to exactly the same operative technic. I have long been converted to the opinion that peptic ulcers should be treated medically and that the great majority of these cases can be cured in this way There are however a number of cases which resist treatment and which present complications which either demand surgical treatment or make surgical treatment preferable in that particular case In ordinary ulcers of the duodenum gastro-enterostomy offers

ing the abdominal wall by first closing the peritoneum and then using three sets of button *tension* sutures which we are so partial to in this clinic, and then closing the rest of the abdominal wall in the usual way with catgut through the anterior sheath of the rectus and silk through the integument.

I now want to show you the gross specimen which we have removed. *Splitting this open I find rather to my surprise, that there is no raw surface of the mucous membrane, that there is a crater-like lesion with rather indurated callous margins, but there is no real open ulcer. On making an incision into this callous ulcer as I divide the submucosa with the knife I can feel that the tissue is very much like a carcinoma, and I feel pretty sure that this is a carcinoma of the stomach. (Note Careful examination of the specimen from the sections taken at five points of the periphery of the lesion and from enlarged glands all showed typical carcinoma.)*

There is one question that occurs to me as I look at this specimen, that is the question of whether this is an old healed ulcer in which a carcinoma has developed, or whether this lesion is a carcinoma which has developed independent of the preceding ulcer. I want to give you my impressions of this problem from observations which I have made in my own clinic. They are these. I do not believe that any large percentage of stomach carcinomas develop from the preceding stomach ulcers. Of course, there is no doubt the development of carcinoma in an old callous ulcer is a definite possibility and I have no question but it occurs, and taking the enormous number of these cases that exist, that it occurs of course quite frequently. But when we ask ourselves the question, In what percentage of cases are carcinomas of the stomach primary lesions independent of preceding ulcers and in what proportion are they secondary to the pre-existing ulcer? the evidence which I have been able to obtain would lead me to conclude that in much more than 90 per cent. of the cases of carcinoma of the stomach the carcinomas occurred independent of the preceding ulcer and that in much less than 10 per cent. of the cases which have carcinomas have they developed in the old callous ulcer or in the scar of the

TWO CASES OF COMMON DUCT OBSTRUCTION

Two Patients with Common Duct Obstruction. History and Operative Findings in Each Case. Difficulty in Diagnosis in Obstruction of the Common Duct.

I HAVE the opportunity of showing you this morning 2 cases of common duct obstruction. The first patient is a woman of fifty five who comes to us with a history of having had repeated attacks of what seems from the description of her attending physician to be gall-stone attacks. In the early history of the attacks she was not jaundiced, but during the last seven or eight months the attacks have been followed by jaundice which, when first present, would develop shortly after an attack, last for some days, and then disappear. During the last eight weeks the jaundice has been persistent, and although it has varied somewhat in intensity it has been, on the whole deepening. You will notice that she is a large woman weighing about 150 pounds even in her present emaciated condition. She did weigh a year ago when she was in good health, about 190 pounds. These attacks have been associated with chills and fever the attack appearing very much from the patient's description like the Charcot fever that is so suggestive of common duct stone with infection in the bile tracts.

We have tested out the coagulation time of her blood a number of times and it is about five and a half minutes. She has 80 per cent hemoglobin and the Wassermann test is negative. For some weeks she has had clay-colored stools with occasionally some evidence of bile.

On physical examination one can find what appears like a very markedly distended gall-bladder in the right upper quadrant but apparently 2 or 3 inches farther outward than the ordinary position of the gall-bladder. I am inclined in this case to make a clinical diagnosis of gall-stones and an obstruction of the common duct. The fact that she has a very greatly distended

I believe, in about 90 per cent. of the cases a cure and in ordinary ulcers of the stomach gastro-enterostomy offers about 50 per cent. prospect of a cure. In the large callous ulcers however the prognosis from gastro-enterostomy is not favorable, and I believe here the second Billroth resection offers the patient much the best prospect of cure just such an operation as I have shown you this morning. Fortunately in ulcer cases the operative mortality is very small, a number of skilled operators having done the operation with no more than 2 or 3 per cent. mortality. The advantages of the operation with resection in callous ulcer are first, that it removes the ulcer second, it removes the pylorus and the element of pyloric spasm is thus eliminated from the case in the third place, by removing a considerable portion of the stomach it diminishes the sum total of the gastric secretion and, as has been shown clinically reduces the free hydrochloric acid content of the stomach very definitely and, above all, this operation has this tremendous advantage, that if the operator has made a mistake and his case is not an ulcer but a carcinoma, or in the exceptional case, an ulcer which is undergoing carcinomatous change, this technic gives the patient the benefit of the same radical operation that we employ for carcinoma of the stomach.

position of the gall-bladder. If you have followed me carefully you will see that in this way we have conserved the nerve supply

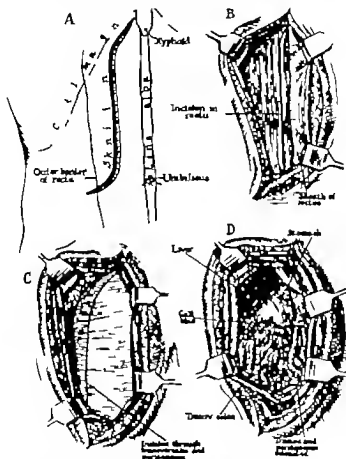


Fig 288.—Modification of S incision in approach to gall-bladder region. *A*, Anatomic relations of incision through skin and sheath of rectus. *B*, Rectus muscle incised, leaving four-fifths of muscle lateral to incision. *C*, Rectus retracted and transversally exposed. *D*, Exposure completed and viscera brought into view.

of at least four fifths of the rectus muscle and at the same time we have obtained a very wide exposure of the liver and bile

gall-bladder would speak, however according to Courvussier's law in favor of not an obstruction of the common duct by stone, but an obstruction from carcinoma of the pancreas. You know Courvussier's law which we have found to be of great service in analyzing these cases is that in 80 per cent. of the cases of obstruction of the common duct from stone the gall-bladder is contracted and not palpable but, on the other hand, in 80 per cent. of the cases of obstruction of the common duct from carcinoma the gall-bladder is distended as it is in this case.

The patient is now anesthetized and I shall make a large S-shaped incision, exposing the bile tracts. I want to say a word in regard to the S-shaped incision (Fig. 288). I have shown you this incision and have emphasized its importance and value so frequently that it would seem unnecessary to take it up in detail at this time. On the other hand, it is so often badly employed that I want to give you the essentials of it here this morning, and tell you that we have in the last few months not modified it in principle in any way but modified it slightly in a way to emphasize what we regard as the correct method of making the incision. We start the incision in the angle between the ensiform and the costal cartilage carry it downward and outward about a fingerbreadth from the costal cartilage until we come to the center of the rectus muscle. We then pass down the center of the rectus muscle to a point just below the umbilicus to a straight line and then about outward and downward for a distance of about 3 inches. This divides the skin, superficial fascia and the anterior sheath of the rectus. We then pick up that portion of the anterior sheath of the rectus which covers the inner half of the muscle and dissect it up from the muscle until we reach the inner border of the muscle or almost to the inner border. We then split the rectus muscle leaving at least four fifths of the muscle to the outer side. Then we retract the rectus muscle well outward with a pair of retractors and expose the transversalis and the peritoneum which are beneath. We then divide the transversalis muscle and peritoneum not at the point where we split the rectus muscle, but about 2 inches external to this, so that it brings us very much nearer the ordinary

stones, enough to fill an ordinary teacup. I now come down to a very large concretion which fills the lower portion of the common duct. With my thumb and finger I carefully push this concretion upward. You see I now deliver it. It is about 2½ inches long and more than an inch in diameter. It is rather pyramidal in form the apex of the pyramid projecting down



Fig. 289 — Diagram of common duct and obliterated cystic duct filled with gall-stones.

ward toward the ampulla and the upper portion or base of this huge gall-stone is smooth and faceted and was in contact with the large faceted stone immediately above it. I introduce now a probe through this greatly dilated common duct readily into the duodenum. I now introduce a scoop upward into the hepatic duct and remove a number of concretions from the hepatic duct. The hepatic duct is so dilated that I can readily introduce my finger and I find we have cleaned the hepatic duct out com-

tracts, and we have obtained this exposure where it is most needed, well out toward the gall-bladder. This form of incision enables us to open up the abdominal wall very high or in the angle between the *ensiform* and the *costal arch*, and this portion of the incision is of particular value in difficult bile tract work. This portion of the exposure cannot be obtained by the ordinary incision over the middle of the rectus which is still practiced by a number of surgeons in spite of the fact that much better exposure of the field can be obtained by this method of incision.

Retracting the edges of the incision I now expose the peritoneal cavity and bring into view this greatly distended gall-bladder. I pack it off with abdominal pads and with a large aspirating syringe draw off, as you see, a considerable amount of pus and mucus from the gall-bladder. The gall-bladder wall is very much thickened and edematous, but I can readily feel through the wall that the gall-bladder is filled with a number of large stones. I now introduce my hand into the abdominal cavity and I find a hugely distended common duct. It feels as though it were 1 inch or 1½ inches in diameter and filled with great masses of gall-stones. I separate the fundus of the gall-bladder from the liver free the gall-bladder completely and I find as I do this that there is apparently no cystic duct, that the gall-bladder and the common duct seem to run into each other without any intervening narrowing as we would expect where there is still present a cystic duct (Fig. 289). I have had this problem to deal with a number of times, and in order to make sure of the situation and prevent any injury of the common duct I shall now split the gall-bladder open and remove the stones. I split the gall-bladder open all the way down to the common duct and I find as I remove the stones that the condition is as I expected. The cystic duct has disappeared, and in place of the cystic duct the neck of the gall-bladder seems to run into the common duct, and at that point the caliber must be at least an inch in diameter. I now cut off the gall-bladder from the common duct, and as I do this you see this large gaping opening into the common duct, and in this opening you can see projecting a large gall-stone. With a scoop I now take out this enormous collection of gall-

Case II.—The second case this morning is a somewhat similar one. This lady had very much the same picture as the first patient, and was operated upon two years ago for common duct obstruction. The common duct also was very greatly distended about 1 inch in diameter and packed full of stones. She had marked enlargement and induration of the pancreas and we thought that it was probably inflammatory and not carcinomatous. She had at that time a very stormy convalescence but finally went on to a complete recovery and was entirely well for a number of months. Then the old attacks recurred and she comes back to the hospital intensely jaundiced one of those greenish-yellow colored skins which is found only after a very long-standing and continuous obstruction of the common duct. Her general condition in spite of the attacks which have been associated with chills and fever is fairly good. Her time coagulation is about five minutes. At the previous operation her time coagulation was between seven and eight minutes and she had a direct transfusion from her husband before the operation. She had a very sharp reaction however after this transfusion, and I have omitted repeating it at this time because her time coagulation is fair and her general condition is better and because I was rather inclined to think that the transfusion done before the last operation did her more harm than good. I know that we shall have a good deal of trouble in operating upon this patient at this time. I have operated on a great many of these old common duct cases where second and third operations were necessary and have found them among the most difficult surgical procedures that I have ever undertaken.

I make in this case as in the former case the same S-shaped incision, and come down to the peritoneal cavity which is entirely obliterated by adhesions. I find it necessary to divide the round ligament of the liver in the attempt to expose the common duct. I do this and doubly ligate it. I find that the duodenum is plastered to the under surface of the liver and with great difficulty I separate the duodenum from the liver. I now feel the enlarged pancreas. I do not believe however that it is carcinomatous. Continuing the dissection, I have at last come

pletely. I introduce a probe first into the right hepatic and then into the left hepatic duct. Examination of the pancreas shows there is a slight induration of the pancreas. There is no evidence of carcinoma, however and I am inclined to believe that we can exclude any probability of carcinoma from the case. I shall drain the hepatic duct in this case. Because of the large size of the duct I use a good size drainage-tube about as large as my index-finger. I introduce also a split-rubber tube containing iodoform gauze down to the opening in the common duct. Because of the fact that both the gall-bladder and common duct contained pus and mucus I shall carry a strip of iodoform gauze in either side down to this opening. I dislike very much to do this because it will be rather painful to remove this gauze, yet I feel that iodoform gauze in this case is the lesser of the evils and will give us a certain amount of protection against infection. We now close the wound as we do in these cases, closing the posterior sheath of the rectus with catgut, and then passing through-and-through sutures of silkworm-gut through the abdominal layers and then catgut through the anterior sheath and silk in the skin. In addition, I shall employ three sets of button sutures which we are now employing in all of these cases. I want to again emphasize the importance of these button sutures. They certainly add a great deal of safety to one of these badly infected bile tract cases.

After-history.—This patient had a rather stormy convalescence. For three or four days she had a great deal of nausea and vomiting and could retain nothing on her stomach. Fluids were given subcutaneously and the stomach was washed out. At the end of four or five days she was able to retain liquids and cereals and her condition improved then quite rapidly. For the first two days the discharge from the tube was pus, mucus, and bile, then the bile became clear. There was a very large amount of bile discharged by the tube. The jaundice very rapidly disappeared and she went on to a very satisfactory and complete recovery. The tube was allowed to remain in the hepatic duct for about two weeks and the bile discharged through the fistula after removal of the tube for about two weeks longer.

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down to the common duct containing a stone. You see that it has taken forty minutes to separate these adhesions and expose the common duct. In other words, we have to fight our way through these adhesions and with the greatest possible care to avoid any serious injury before we can expose the common duct sufficiently to palpate it and to incise it. Lifting the common duct on the index-finger of my left hand and holding this mass of stones between the index-finger and thumb I make an incision down through the common duct on to the underlying stone. Doing this I divide a vessel of fair size which I clamp and ligate. I now open the common duct and out of it comes some pus and mucus, but no bile. With a scoop I remove these gall-stones which, as you see are partly formed gall-stones with facets and partly debris of cholesterol and pus. With great care and with great gentleness I scoop out all of this debris and pass a probe through the common duct into the duodenum which I find I can do without any difficulty. I also pass a probe up through the hepatic duct. I believe we have now removed all the gall-stones from the common duct. From our previous experience with this case I am going to provide drainage for a long time—for a number of weeks—and in order to do this I am going to introduce a T tube. I take therefore, a good size T-tube and cut it off so that the short arm will go into the hepatic duct for a distance of $1\frac{1}{2}$ inches and the long arm down in the common duct for a distance of $1\frac{1}{2}$ inches. I then set the T tube in position and as in the previous case I carry a split-rubber drain with iodoform gauze in it down to the closed incision. I close the external incision just as we did in the last patient.

After-history—This patient, considering her condition, made a very satisfactory recovery. For the first forty-eight hours nothing but pus came out through the tubes evidently little or no bile was secreted by the liver during this period. Then the bile began to flow out of the tube and this gradually increased and for a number of days was very copious. The first few stools were clay colored, but within four or five days the bile passed readily through the T tube into the intestine and the stools were deeply bile stained. The jaundice faded and gradually

finally disappeared and the patient went on to a good recovery the T tube being left in position for four weeks and then removed without great distress though I thought it wise to give the patient a whiff of gas in order to make this procedure more bearable.

I want to take the opportunity of referring to 2 other cases which we have recently had which illustrate the difficulties in diagnosis and the uncertainties of diagnosis in cases of obstruction of the common duct. We have recently operated upon a case very much like the patients we operated upon this morning in which the findings at operation and the after history demonstrated a different pathologic condition. I operated upon a woman of fifty some weeks ago who presented clinically very much the same picture that existed in the first patient operated on this morning—repeated attacks which were consistent with being gall-stone attacks followed by jaundice which gradually deepened and when the patient was brought to our service she had a definite enlargement of the gall-bladder. Under local anesthesia, because the patient's condition was so bad I simply drained the gall-bladder. I made a rather superficial examination of the abdominal contents sufficient, however to satisfy myself that she had a carcinoma producing obstruction of the common duct presumably the primary site of the carcinoma being the pancreas. There was no difficulty about introducing under local anesthesia a drainage-tube in the gall-bladder. It contained at that time simply bile-stained mucus. At no time did any considerable amount of bile escape. The patient continued to be jaundiced and finally left the hospital slightly improved and still having the tube in the gall-bladder. I referred her to one of my colleagues who took care of her at home. He reported to me that within a few weeks she commenced to pass gall-stones through the fistula alongside of the tube and that she improved somewhat. Because of the uncertainties in her case I had her brought back to the hospital and under general anesthesia opened up the incision exposed the gall-bladder and found that it was full of gall-stones but in addition, there was a great mass which certainly must have been carcinoma of the

pancreas, surrounding the common duct. I simply removed the stones from the gall-bladder introduced a tube and she made a good operative recovery. The jaundice persisted and she is apparently now dying of general carcinomatosis.

I want also to refer to a case which will illustrate another phase of this condition of common duct obstruction. Recently a patient upon whom I had operated in 1918 came in to see me apparently in the best of health. I looked up my records and found these interesting facts. The patient in 1918 was a man of forty. He had had a number of attacks consistent with being gall-stone colics. In the early history there was no jaundice but in the last two months before I saw him jaundice developed and became persistent varying somewhat in intensity. During his gall-bladder attacks he had slight temperature and increased leukocyte count and tenderness over the gall-bladder region. Dr. B. W. Slippy and myself saw him in consultation and made a clinical diagnosis of common duct obstruction. I operated on him in January 1918. I exposed through a large S-shaped incision the liver and bile-ducts and found no evidence of stone in the gall-bladder. With my finger in the foramen of Winslow I could feel a large mass which was consistent with being either a chronic interstitial pancreatitis or a carcinoma of the pancreas. I incised the gall-bladder and thought from its gross appearance that the tumor was probably carcinomatous. No stones were to be felt after the gall-bladder was opened. I then opened either the upper part of the common duct or the hepatic duct. I could not be sure which, and introduced a tube into the gall-bladder and drained in this way both the hepatic duct and the gall-bladder. After we had made the exploratory operation we came to the conclusion that we were dealing with a primary carcinoma involving the bile tracts and pancreas and the tubes were maintained in position for a number of months. The patient made a rather slow recovery gradually the jaundice disappeared and his general condition improved. He finally went on to a complete recovery and is now in apparently perfect health without any evidence of his old trouble.

We have had a number of similar cases. We evidently had

to deal in this case with a chronic inflammation of the gall-bladder and bile tracts a chronic cholecystitis and cholangitis without any gall-stones but with a very marked chronic interstitial pancreatitis which led us even at the exploratory to believe that we had a carcinoma to deal with. Of course the result and the fact that it is more than four years after operation and the patient is entirely well settles the diagnosis and eliminates entirely the possibility of carcinoma and makes certain the diagnosis of infected bile tracts with secondary chronic interstitial pancreatitis. Cases of this kind are now well known and a large number of them can be found in the literature. We owe, I think, to Mayo-Robson more than to anyone else our knowledge of these cases. I can remember quite well that about twenty years ago Robson reported a number of these cases which he had believed at the time of the exploratory to be carcinomas of the pancreas and where he drained either the common duct or the gall-bladder and found later that instead of being a carcinoma the patients went on to complete recovery demonstrating the fact that the swelling was inflammatory and not malignant. This possibility we should always keep in mind. It is the one hopeful side of these cases which appear like carcinomas of the pancreas and these experiences teach us the importance of draining the bile tracts in these cases and the importance of maintaining this drainage for a long period of time with the hope that the condition may not be malignant, but may be inflammatory and one which may go on to a recovery under proper drainage of the bile tracts.

I want to say one further word in regard to this group that from our own experience we rely more upon the external drains than we do upon cholecystenterostomy. I am quite aware that this is a disputed point, but my own clinical results and the experiments of my assistants in doing cholecystenterostomies on dogs have led us to believe that cholecystenterostomies carry with them a good deal of risk of ascending infection of the liver which of course is one of the things we should especially avoid in these cases.

CLINIC OF DR. KELLOGG SPEED

PRESBYTERIAN HOSPITAL

INFRACTION OF THE HEAD OF A METATARSAL BONE

Infraction of the Head of the Third Metatarsal Bone in a Girl of Fourteen. Incidence Cause, Pathology Symptoms, and Treatment of this Condition.

A *FOURTEEN-YEAR-OLD* school girl was seen in December 1920 complaining of pain of six months duration on the dorsum of the foot and at the base of the toes. So far as she could recall there had been no trauma to this foot. She had been fitted with and worn a metal arch support with some relief but for the immediately preceding six weeks the pain had grown so severe that she could scarcely walk. There was no loss of weight, no night-sweats no cough. Her appetite was poor her tonsils had been removed five years previously.

Physical examination at the Presbyterian Hospital revealed a scoliotic spine a general tendency to lax joints, but was otherwise negative. The left foot showed some swelling over the head of the third metatarsal bone where there was tenderness on pressure and weight bearing, or when the middle toe was strongly manipulated. Roentgenologic examination of the chest failed to discover any active tuberculous process. There were shadows of possible mediastinal glands. Roentgenogram of the foot (Figs. 290-291) showed a flattening of the head of the third metatarsal bone evidenced in both anteroposterior and lateral views. Infraction of the head of the bone was diagnosed and on account of the long-standing history of pain, together with the joint swelling and possible presence of a loose piece of bone arthrotomy with removal of any loose bone

fragment was suggested. This was refused and the foot was put at rest. After one month the pain had disappeared and did not return following use. At this time, over a year having passed, the young woman can walk and run without pain in the affected region.

Information about this delicate type of fracture of the metatarsal head has developed recently. The first report



Fig. 290—Roentgenogram showing the head of the third metatarsal bone plainly flattened and distorted. This change in contour is characteristic of infraction and is remote from the epiphyseal line.

was made by Freiberg in 1914 mentioning 6 patients. In all I find 14 instances of infraction of the metatarsal head reported, one by P. G. Skillern, J. 4 by Campbell, and 3 by Painter to which is added my patient making 15.

Freiberg, *Surg. Gyn. and Obst.* August 1914.

P. G. Skillern, *J. Am. Surg.* 1915, 70, 371.

Campbell, *Amer. Jour. Orth. Surg.* 13, 271.

Painter, *Boston Med. and Surg. Jour.* 1921, 184-183.

Incidence—A majority of the instances reported occur in girls under eighteen years of age. In these young women the epiphysis of the metatarsal bones have not yet closed, and yet the condition is not one of epiphyseal separation. Women and boys, probably very seldom men, are subject to this fracture. During the war many observers recorded disability among young soldiers arising from metacarpal derangements. These



Fig. 291.—Roentgenogram of same case, lateral view showing the same characteristic flattening of the metatarsal head found in infraction. There seems to be absorption of calcium salts from the crushed head, but no loose fragment can be distinguished.

were called everything from overstrain to fracture, but no infractions of the metatarsal head were reported.

Cause—Some patients, as my own fail to recall any specific date on which the trouble began. Others have distinct remembrance of stumbling or tripping, which was the onset of their disability. Jumping, stumbling while playing tennis, tripping and stubbing the toe as in a basket ball game when the toes were dorsiflexed, was the usual contributory cause given

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Painter—Boston Med. and Surg. Jour. 1921 181: 533.

creased pressure when its weight bearing is at a maximum and when the toe is dorsally flexed but this pressure is applied largely at the end of the bone in an anteroposterior axis, and expends itself on the broadened head of the bone to force it on to the shaft, possibly in a slightly posterior direction. The thin cortex of the head of the bone is driven in on to the underlying cancellous tissue infraction results, sometimes called egg-shell fracture and the skiagram reveals a flattening of the head with some broadening and foreshortening where the cancellous trabeculae have been crushed together. In some instances the cartilage of the joint surface together with the shell of cortical bone, may be entirely separated from the head, to come to lie freely within the joint, acting as a foreign body on account of deprivation of its blood-supply. The outer layers of cells are probably nourished by the surrounding synovial fluid as in injuries of the intra-articular carpal bones.

Hemarthrosis in this joint may follow serous effusion always does and there results distention of the joint rarely I believe any tearing of the joint ligaments. This joint swelling usually persists because the condition is not recognized and use (walking) is continued. Bone formation may be stimulated so that small osteophytic projections develop. If there has been true infraction and compression of cancellous bone trabeculae a greater density of the bone in that area may be shown in the skiagram. If a layer has been partially separated off from the head of the bone losing its blood-supply it may preserve its original density as would a sequestrum. Later it would appear as a deeper shadow in the skiagram, and in contrast to some atrophy of disuse developing in the remainder of the bone or neighboring metatarsals, lead to a mistaken roentgenologic interpretation. Possibly this condition is the one described by Köhler as a diseased condition of the metatarsophalangeal articulation. He showed 2 cases at the Deutsche Roentgengesellschaft in 1920 claiming that the condition attacks the second metatarsal, so that the distal third of the bone becomes involved with nearly complete disappearance of the head or neck, or else the head is pressed in or flattened or the joint surface alone may be flattened

by the athletically inclined young women or boys who suffered with this condition.

Pathology—It must be remembered that there is diversity of projection as well as strength of the metatarsal bones. The fifth projects the least, the fourth the next but the projections of the heads of the *inner* three bones vary. The third bone may reach as far as the second never beyond, yet both of them may be longer or shorter than the first bone. The third metatarsal is the most delicate and is a weak bone the second may be the strongest next to the first, or the weakest of all five in fact, it is the most variable.

In the anterior part of the long arch of the foot the second and third bones occupy the highest plane in a cross-section. While all metatarsals articulate with the tarsus, the first has most freedom of motion the fifth next, and fourth third or second very little if any independence of movement, on account of the interlocking character of their apposition one to another. The second and third bones lying parallel and straight anteroposteriorly form a narrow angle with the other bones which diverge slightly so that most of the body weight is transmitted through the head of the second metatarsal bone to the tarsus. To stand, to bear weight on both normal feet necessitates chief points of support in the calcaneus, shaft, and head of the fifth metatarsal and the head of the first metatarsal. To walk, however the main points of contact with the floor are constantly changing. The heel strikes first, the sole next and the body weight is then carried forward on to the heads of the metatarsal bones, so that during the termination of the step the four inner metatarsal bones and their toes are the main points of support, while the second and third metatarsal heads form the most direct support of the anterior and of the longitudinal arch of the foot. In this final act of stepping the second and third metatarsals therefore subject themselves to direct pressure of all the body weight. So the soles of the shoes wear out over the head of the second bone calluses on the sole are frequently found there. In the act of stumbling or stubbing during weight bearing this point of foot support is subjected to suddenly in-

may lead to difficulty in diagnosis. A careful study of the two-way plate will reveal the flattening or indentation of the metatarsal head in infraction; the presence of loose bodies makes a differentiation difficult. General physical findings will settle the difference. Osteo-arthritis seldom occurs in these young people, nor is it monarticular.

Treatment.--The indications for treatment are to remove the irritating bone which may have come to act as a foreign body and to remove the irritation of weight bearing. If there is no roentgenologic evidence of loose bone fragment, complete cessation from weight bearing for one month will probably effect a cure. A small pad or plate arranged for transverse arch support just posterior to the metatarsal head may prevent a recurrence of symptoms. If loose bone is present arthrotomy with removal of fragments, resuture of the joint, and subsequent rest from weight bearing promises cure.

One of Painter's patients subjected to operation yielded a thin film of granulation tissue between the cartilage and shell of the head of the metatarsal bone. The cartilage was lifted out of the joint, the end of the bone was curetted, and the wound closed, with a complete recovery following.

down. He opened the joint of one patient to find gray granulations. Five patients had been seen by him the condition as always unilateral but he had been sent the skiagrams of the feet of a sixteen-year-old girl in whom the condition was bilateral. My patient suffered the injury solely on the third metatarsal head. This is the only one so reported, although the roentgenogram of one patient of Campbell's suggests injury of the third bone in addition to the second. A position of slight adduction of the foot might lead to injury of the third bone instead of the second, especially if the second bone were quite short.

Symptoms.—With an understanding of the cause and pathology it is not difficult to believe that the patient may not complain of great disability at first. The stub of the toe although causing momentary sharp pain, might easily be forgotten. Pain and soreness in the toe joints gradually assert themselves, especially after exertion. There may be no ecchymoses or abrasions. If the bone head has been flattened an exostosis and thickening of the capsular structures about the joint may follow the head of the bone involved feels thick on examination. There is swelling exquisite tenderness, and pain on pressure of this head. The disability may be such that the patient walks with a decided limp and may show some atrophy of the calf muscles in that leg. The skiagram shows the flattening or thickening of the bone head regional bone atrophy, possibly osteophytic outgrowths, and corpora libera of detached bone in the joint. When the second toe is manipulated there may be pain or stiffness in its joint or in some instances exaggerated joint crepitus in the metatarsophalangeal joint. The symptoms tend to persist.

A differential diagnosis must consider metatarsal pain from flattening of the anterior arch. The skiagram is very helpful and because the patient is a large adult differentiation is not difficult. Morton's disease is paroxysmal and involves mostly the fourth metatarsal fracture of the fibular sesamoid (very rare) occurs in adults and is differentiated by skiagram tuberculosis or even acute low-grade osteomyelitis of the metatarsal

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One of Palmer's patients subjected to operation yielded a thin film of granulation tissue between the cartilage and shell of the head of the metatarsal bone. The cartilage was lifted out of the joint, the end of the bone was curetted and the wound closed with a complete recovery following.

down. He opened the joint of one patient to find gray granulations. Five patients had been seen by him the condition was always unilateral, but he had been sent the skiagrams of the feet of a sixteen-year-old girl in whom the condition was bilateral. My patient suffered the injury solely on the third metatarsal head. This is the only one so reported, although the roentgenogram of one patient of Campbell's suggests injury of the third bone in addition to the second. A position of slight adduction of the foot might lead to injury of the third bone instead of the second especially if the second bone were quite short.

Symptoms.—With an understanding of the cause and pathology it is not difficult to believe that the patient may not complain of great disability at first. The stub of the toe although causing momentary sharp pain, might easily be forgotten. Pain and soreness in the toe joints gradually assert themselves, especially after exertion. There may be no ecchymoses or abrasions. If the bone head has been flattened an exostosis and thickening of the capsular structures about the joint may follow the head of the bone involved feels thick on examination. There is swelling, exquisite tenderness, and pain on pressure of this head. The disability may be such that the patient walks with a decided limp and may show some atrophy of the calf muscles in that leg. The skiagram shows the flattening or thickening of the bone head, regional bone atrophy possibly osteophytic outgrowths, and corpora fibra of detached bone in the joint. When the second toe is manipulated there may be pain or stiffness in its joint or in some instances exaggerated joint crepitus in the metatarsophalangeal joint. The symptoms tend to persist.

A differential diagnosis must consider metatarsal pain from flattening of the anterior arch. The skiagram is very helpful, and because the patient is a large adult differentiation is not difficult. Morton's disease is paroxysmal and involves mostly the fourth metatarsal fracture of the tubular sesamoid (very rare) occurs in adults and is differentiated by skiagram tuberculous or even acute low-grade osteomyelitis of the metatarsal

MYXOMA OF JAW

Tumor of the Jaw Appearing in 1909 Following the Extraction of Tooth. Four Operations Performed for its Removal with Recurrence Following Each. Present History Operation. Results.

In 1907 this young woman experienced trouble on the right side of her lower jaw on account of the incrowding of a small tooth. Within a year this tooth was extracted, and in 1909 a lump appeared on the jaw at the site of removal. A surgeon working inside the mouth chiseled off this lump but before the middle of 1911 the tumor reappeared on the jaw. A second surgeon then cut through the neck externally below the jaw level after removing another tooth and cut away some of the hard tumor mass. Within the subsequent year (1911-12) two additional operations were performed to reduce this enlargement.

The patient first consulted me on May 3 1919 nearly twelve years after the onset of the disturbance. At that time four teeth were wanting on the right mandible and their space was occupied by a hard rounded painless tumor the size of a small egg. There was some interference with chewing and articulation but no ulceration existed through the mucous membrane covering the tumor. On the skin surface of the neck and jaw were two scars one quite thick, indicating healing by secondary intention but there was very little external evidence of tumor mass to be seen. The patient was apparently in good health no enlarged lymph nodes were palpable in her neck and physical and roentgenologic examination of the chest revealed no suspicious dulness, breathing sounds, or shadows which would indicate metastases. Her weight was 130 pounds.

The roentgenogram of the jaw (Fig 292) showed a diffusely invading tumor of the mandible evidently confined by the periosteum with large clear spaces showing no bone shadow

was advised especially since half-hearted previous attempts at excision had proved valueless and had possibly led to recurrence.

From the surgical standpoint we were confronted with the problem of complete removal no matter what the extent of the tumor invasion. This meant the sacrifice of perfectly normal appearing teeth and considerable extent of jaw which would lead to mechanical problems immediately following operation, and later replacement of bone to furnish a basis for a masticating surface. There were moreover two scars from previous operations from a cosmetic standpoint we wished to avoid adding any facial disfigurement.

On May 20 1919 a preliminary ligation of the right external carotid artery was performed through a small incision, and then through her stretched and retracted mouth a complete removal of the right mandible was performed, taking its covering of mucous membrane along with it from just in front of the last molar to and beyond the canine of the left side passing beyond the line of the symphysis in front. By doing this work through the open mouth an external wound and scar were avoided. We were surprised to find that the tumor had grown nearly 2 inches along the medullary cavity beyond any apparent involvement of the bone, passing the symphysis and invading the left side. The first area of resection of the mandible at about the middle line showed this invasion and necessitated a removal of an additional inch of bone on the left side. A close inspection of both removed and remaining surface showed what seemed to be normal bone section.

To avoid collapse of the remaining portion of the mandible the teeth on the left side were wired snugly to the upper jaw holding the remainder of the mandible in its proper relation. On the stub end at the right side only one tooth remained in front of the ramus, and it was impractical to attempt to wire it to the jaw above.

Mouth-washes were used after operation, and ten days later the patient left the hospital, the ligation wound cleanly healed. The mucous membrane within the mouth rapidly closed down over the defect created by operation.

partition walls of bone trabeculae crossing through the mass. The main portion of the tumor was rounded and extended along the mandible by prolongations into the medullary cavity the cortical bone being the last to give way before the advancing growth. No new subperiosteal bone seemed to be laid down. The roots of neighboring teeth were surrounded by this invasion and yet they were not loose in the alveolar process. The findings were not definitely those of osteitis fibrosa either in the roentgenogram or in the clinical examination and history.



Fig. 292.—Roentgenogram of myxoma of jaw taken May 12, 1919. The fine bony trabeculae, the enlargement of the mandible, and the loss of teeth are evident in the roentgenogram. There is no deposition of new subperiosteal bone.

The tumor had been operated upon with at least partial removal several times. It had recurred as a steadily growing hard tumor not cystic to palpation, not yet ulcerating through its mucous covering, not giving gross evidence of glandular metastases, but *insidiously* invading the jaw substance, particularly in the medullary cavity. These facts coupled with the evidence that the tumor mass seemed still to be contained within the periosteum, led to a belief that we were dealing with a bone tumor relatively and originally benign, but which was gradually assuming a malignant aspect. Consequently radical removal

was advised, especially since half-hearted previous attempts at excision had proved valueless and had possibly led to recurrence.

From the surgical standpoint we were confronted with the problem of complete removal, no matter what the extent of the tumor invasion. This meant the sacrifice of perfectly normal appearing teeth and considerable extent of jaw which would lead to mechanical problems immediately following operation, and later replacement of bone to furnish a basis for a masticating surface. There were moreover two scars from previous operations from a cosmetic standpoint we wished to avoid adding any facial disfigurement.

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Mouth-washes were used after operation and ten days later the patient left the hospital the ligation wound cleanly healed. The mucous membrane within the mouth rapidly closed down over the defect created by operation.

On July 5 1919 the patient entered the hospital for a transplantation of bone to fill the existing jaw defect. A plaster-of-Paris mold was made of the mouth, the wires on the teeth being temporarily removed and the exact size and shape of the defect were estimated. To fit the transplant to the curve of the jaw was one difficult point to arrange. After some study we found that the curve of the eighth rib in its extreme posterior portion near the spine entering into the angle almost exactly fitted. A measured section of the eighth rib was therefore removed



Fig. 293.—Roentgenogram taken soon after resection and transplantation of bone. Jaws are wired together. Note the curve of the transplant.

with its periosteum intact and was split in half. An incision into the cheek was made just below the jaw level and the two ends of the mandible were exposed and freshened, while the gutter in the cheek tissues was prepared for reception of the transplant without opening into the mouth. At the proximal end of the mandible near the ramus, the rib was inserted snugly into the reamed-out medullary jaw cavity while at the distal end the attachment was made by catgut tied through drill holes in both bone segments. The soft parts and skin were closed over

the transplanted rib the teeth remaining wired together as before (Fig 293)

On August 22 1919 the wires in the teeth were released and use of the jaw encouraged. There seemed to be a firm bony union at each end of the transplant and the fair jaw alignment on the left side held in position. By September 25 1919 it appeared that the proximal end of the transplant was loosening



Fig 294—Roentgenogram taken February 12, 1922. The transplant has enlarged, molded itself to the jaw and furnishes chewing support. There is no evidence of recurrence in the mandible and the transplant promises to enlarge further

slightly and a roentgenogram confirmed the lack of union at this point. The teeth were rewired, but on January 3 1920 the non-union seemed established beyond doubt, and consequently eight days later under local and gas anesthesia, a small sliver of tibial crest was removed and inserted into the jaw to bridge this defect. Contact with transplant and jaw stump was maintained by absorbable sutures. At this operation the end of the rib transplant did not appear especially healthful. When scraped

to freshen its surface there was but slight bleeding and it looked whiter than normal, with some osteoporosis. This fibrous union of rib to jaw was sparingly yet completely cut away. The teeth wiring broke the day after operation, but was reapplied within a few hours.

During the next three months the jaw was kept wired. On April 10 1920 the wires were removed and bony union was



Fig. 295—Photograph of patient with myxoma of jaw taken ten years after resection of jaw and transplantation of bone. The white scar is that of the operation several years before.

found. The condition of the transplants at this time—nearly two years after—is shown in Fig. 294. The jaw functions very well, is strong and bears artificial teeth. There has been no infection or sinus development (Fig. 295).

The gross specimen was cut into six sections to permit examination of the extent of the tumor and its general character.

latica. It was grayish white softly gelatinous or mucilaginous in character and was not surrounded by any thickened wall of bone. Its progression into the mandible apparently was via the medullary cavity. In some parts of the main tumor there were areas of old bone remaining completely surrounded by the soft tumor mass.

A microscopic section was made of this tumor and its surrounding bone. At no place was there demonstrated a malignant type of invasion of the bone substance. The tumor seemed to be limited not by a definite capsule but by a layer of fibrous cells quite like those in the body of the tumor mass. There was no effort at new bone formation beneath the periosteum and the surrounding soft parts did not appear invaded. The main body of the tumor mass was composed of connective-tissue cells with short fibrille filled in with homogeneous mucoid substance. No giant-cells, osteoclasts, or round-celled infiltration were seen. There were no mitotic figures. The included islands of bone surrounded by the tumor were dead. A diagnosis of myxoma of the jaw was made primary to the best of our knowledge, as no other tumor has appeared and as a radical resection had led to no recurrence after three years it seems probable that this tumor was a true primary myxoma of the mandible.

Myxoma is defined as a tumor composed of mucous-like tissue and consequently a primary myxoma which possibly takes origin in embryonal mucous tissue is not frequently found. We often see however other tumors of mesoblastic type such as fibroma, chondroma, or even lipoma which show areas of myxomatous degeneration. Where the tumor is of rapid growth the possibility of myxosarcoma is great. In the slower growing mass we may expect a true myxoma. But in dealing with any such mucoid-like tumor which is apparently benign there is the greatest necessity for radical excision. They do recur they invade insidiously and slowly and have enough aspect of malignancy to warrant treatment as if malignant. Bloodgood states that the only cures of central myxoma of bone of which he is aware were those in which the involved bone had been removed.

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Fig. 295.—Photograph of patient. His myxoma of jaw takes two years after resection of jaw and transplantation of bone. The visible scar is that of the operation several years before.

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by resection or amputation, without exposure of the tumor tissue. This corresponds to our technic adopted on this patient. Ewing agrees with these ideas, and after describing the tendency of the mucous material to infiltrate the surrounding tissue, with a clinical course of a slowly growing tumor producing few other symptoms than local swelling and pressure states that there is no recurrence after complete extirpation.

Virchow mentions that primary myxoma of bone is derived from the mucous tissue of the bone-marrow that it infiltrates the periosteum, and causes absorption of bone. Secondary myxomas may be present in bone but represent rather a mucous degeneration of fibroma, chondroma, or osteoma, and are usually surrounded by a bony shell of new bone laid down by the periosteum. Portions of the original bone may be included in the substance of the tumor.

In Perthes' article on the Jaw he mentions the fact that myxoma occurs with about equal frequency in the upper and lower jaw and mentions 2 cases which involved the antrum of Highmore.

Our report of this instance confirms these previous statements. Primary myxoma of bone should be treated as a malignant tumor and should be subjected to radical resection as soon as diagnosed. Its main features are those of slowly growing tumor causing no pain, progressing via the medullary cavity of the bone leading to no regional metastases and affording roentgenologic findings which simulate cystic bone disease without periosteal thickening covering the tumor.

Our patient shows all the hoped-for phenomena of growth in the implanted bone which is responding to the work demanded of it and promises to assume nearly full-sized jaw proportions.

CLINIC OF DR. CARL BECK

NORTH CHICAGO HOSPITAL

STRICTURE OF SMALL INTESTINE (INTESTINAL OBSTRUCTION—MECKEL'S DIVERTICULUM)

Patient with History of Abdominal Distress Dating Back Eighteen Months. Relief Not Obtained by Removal of Appendix. Diagnosis Finally Made by Inflation of the Peritoneal Cavity with Oxygen gas. Operation. Examination of Specimen.

WILLIAM S. enters the Radiologic Department of the North Chicago Hospital on the service of Dr. B. H. Orndoff.

The history of the young man's sickness dates back to July 1920 about a year and a half ago when the patient came down with symptoms of an acute distress in his abdomen, which gradually seemed to point to an acute appendicitis so severe that the doctor decided upon an immediate operation. His report on the case is as follows:

In August, 1920 this boy was sent to me from a neighboring town in an acute attack of a recurrent appendicitis. He was in the second day of the attack when admitted to the hospital here. On operating the appendix was found necrotic, and a very moderate exudate on its walls involving the adjacent terminal ileum. The appendix was removed and drainage established. Forty-eight hours following the drain was removed and an uninterrupted recovery ensued.

Although the very acute symptoms immediately disappeared the patient was not well; he kept on suffering from abdominal pain, and particularly from such symptoms as would indicate a partial intestinal obstruction. When these symptoms did not improve in due time another surgeon was consulted in a neighboring town. He was of the opinion that adhesions from the first operation were the cause of the complex of symptoms. He therefore recommended reopening of the abdomen and

by resection or amputation without exposure of the tumor tissue. This corresponds to our technic adopted on this patient. Ewing agrees with these ideas, and after describing the tendency of the mucous material to infiltrate the surrounding tissue with a clinical course of a slowly growing tumor producing few other symptoms than local swelling and pressure states that there is no recurrence after complete extirpation.

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Our patient shows all the hoped-for phenomena of growth in the implanted bone which is responding to the work demanded of it and promises to assume nearly full-sized jaw proportions.

January 21 1922 under general anesthesia, a median incision was made. As soon as the peritoneum was exposed it was clear that there was some very unusual pathologic condition present

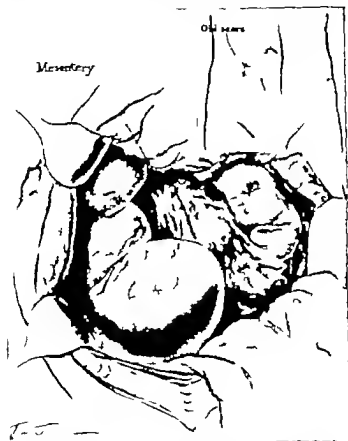


Fig. 296—Sketch showing location of old scars and site of incision in present operation. Note condition found on opening peritoneum.

A very distended loop of small bowel presented itself below the midline (Fig. 296). The distention leaned somewhat to the right side and it was with great difficulty that we could follow the largest pouch to a point of fixation and stricture

separation of the adhesions. The patient consented and the operation was done immediately, but even this second operation and the trial of straightening out the course of the cecum and adjoining intestines did not cure the young man, for he had several attacks of very bad obstruction symptoms, with vomiting, collapse, and a great deal of pain. In one of these attacks he nearly went under. In the course of a year he recovered between the attacks sufficiently to consult some of the most competent surgeons and physicians, who however could not find the cause of these repeated attacks because most likely at the time of consultation he was just in one of his quiet periods. This probably accounts for the failure to determine the seat of trouble. Though he was very carefully fluoroscoped with the ordinary barium and bismuth method and his intestinal canal was well gone over by one of the best roentgenologists of our country, no evidence of a palpable pathologic lesion could be pointed out. He was told that his symptoms were of nervous origin and he was dismissed with the advice to return when more serious symptoms set in.

He was referred to Dr. B. H. Orndoff's clinic after his last attack, and arrived January 20, 1922.

Examination with the ordinary clinical methods did not reveal any more than had been brought out before, but with the pneumoperitoneum method advocated by Dr. Orndoff the findings were as follows:

x-Ray observation after barium meal showed much distortion of outline in the region of the terminal ileum, cecum, and ascending colon, as well as in other loops of small intestine. There was considerable delay or partial obstruction at one point.

After inflation of the peritoneum with oxygen-gas (pneumoperitoneum) there was positive evidence of lateral fixation of small intestine—near umbilicus—to the anterior abdominal wall as well as to the lateral and posterior abdominal wall, which accounted for the delay and partial obstruction at this point.

Diagnosis, therefore: Stricture of small intestine with occasional total obstruction.

He was, therefore, turned over to us for an operation, and on

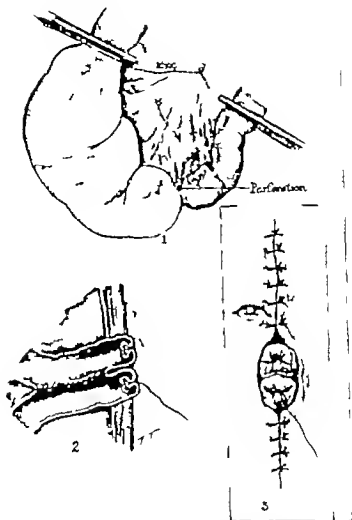


Fig. 297.—Drawing showing technique of resection.

of reopening the upper branch of the anastomosis and allow the contents of the intestines to flow out well (a very important procedure in a case of ileus). The rest of the peritoneum was closed and the abdominal wall sutured in the usual manner.

Beyond this structure the small bowel was very much reduced in size in fact, very much like an atrophied bowel of a child. At that fixed point the stricture corresponded in its location to the middle abdomen, and the very much shortened mesentery was infiltrated and contained something like a nodule of the shape of a large gland. This small tumor mass seemed to be locked in the mesentery or adherent to the side of the same by adhesion.

I feared that in trying to bring this structured portion with the short mesentery into better view I would rupture the bowel, and therefore walled off the exposed intestine toward both sides with sponges. As I was apprehensive, the bowel really ruptured by a very slight traction, and the contents of the distended pouch of the bowel emptied themselves and were sucked up by sponges. As soon as the distended bowel came down in size we could make that tumor mass to the side of the mesentery more visible, and we found that it was only adherent to the outside of the mesentery and not enclosed in the same. It also had a connective-tissue process toward the umbilicus.

We now proceeded to make a resection of as much of the small intestine as was necessary to establish lateral anastomosis (Fig. 297). We clamped the proximal and distal portions of the bowels and resected about 10 inches on either side. We closed the ends and ligated all of the vessels of the very constructed mesentery after resection of that portion of it which was coherent with the tumor mass on the side of it. We then proceeded to make a lateral anastomosis of quite good size between the two ends of the resected bowel. This portion of the small intestine containing the lateral anastomosis and two short pouches beyond the anastomosis were sutured to the abdominal wound as a matter of precaution and safety in such a manner that the two pouch ends were in the level of the abdominal wall while the anastomosis was inside of the abdomen. We used this procedure for two reasons. In the first place to insure against the possibility of danger from peritonitis in this case in which the abdominal peritoneum was soiled, and second, in case of obstruction on account of flexion there is the possibility

I would suggest that at intervals of from three to six months observation should be repeated with a view of ascertaining the degree and character of delay or obstruction following barium meal, and if necessary further pneumoperitoneum in order to assist in the direction of releasing fixed viscera.

The specimen (Fig 298) still shows a considerable dilatation of the proximal part of the intestine and a rather narrow lower bowel. It shows furthermore the ulcer on the site of the stricture. The tumor which seemed to be adherent to the side when opened up showed a structure of intestine with a distinct mucosa and muscularis. It was filled with purulent intestinal contents showing that it was in its structure really a bowel in a blind little corner leading toward the ulcerated portion in the bowel and the whole pouch could be separated from the rest of the intestine and mesentery. What was this separated pouch of bowel?

I could not find any explanation except that it was a Meckel diverticulum and that it was slightly coherent with the bowel and very loosely coherent to the abdominal wall this cohesion running in toward the umbilicus. This is an unusual condition of Meckel's diverticulum leading to a stricture and ulceration of the bowel at its junctions.

What makes this case most interesting is the fact that a diagnosis of this condition could be made with the aid of the inflation of the peritoneal cavity with oxygen-gas and the fluoroscopic proof of an abnormality outside of the region of suspected pathologic conditions.

Clinically it is hardly possible to diagnose such conditions and even the ordinary method of bismuth and barium fluoroscopy and filling the intestinal canal is not sufficient because the distended bowel above the stricture filled with bismuth would mislead the observer and make him see a structure very similar to the cecum or else the bismuth would pass through the stricture at the time when the bowel was not totally obstructed and would escape the observer as it has escaped the observation of the very best radiologists who had a chance to examine the case but making the intra-abdominal structures visible by the use of oxygen makes such a diagnosis possible.

The patient made a very good recovery. After twenty-four hours the projecting part of the intestine had already sunk into the level of the peritoneum so that nothing of it was visible but during the next eight days there developed a slight inter-tinal discharge showing that there was a very slight leak in the bowel and proving to us that we were correct in our technic but this slight leak closed very rapidly and at the end of three



Fig. 296 —Photograph of portion of bowel removed.

weeks the patient left the hospital in good condition. H. was repeatedly fluoroscoped and the report of D. Orndoff reads as follows:

"Several observations following barium meal have been conducted since the operation and very little delay has been noted no more than could be accounted for by the spastic irritation so soon after the operation.

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CLINIC OF DR. LEIGH F. WATSON

RUTH MEDICAL COLLEGE

PARTIAL ENTEROCELE

Patient Suffering from a Partial Enterocoele. History of Case. Operation. Discussion of Enterocoelas.

I wish to discuss with you this morning the subject of partial enterocoele and to present a patient on whom I operated a few days ago.

A partial enterocoele is a strangulated hernia in which only a part of the circumference of the intestine is caught in the constriction ring. There are various names applied to this condition, such as Richter's hernia, nipped hernia, masked hernia, lateral pinching of the intestines, and Lavater's hernia.

This patient is thirty five years old. She had had symptoms of partial obstruction for twelve hours. On account of the absence of vomiting and absolute constipation she thought the condition would improve after taking a laxative. This illustrates a point I will emphasize later. The delayed diagnosis often results in a late operation consequently the mortality is much higher than it should be.

When I first saw the patient a small tender mass in the right femoral region was found on examination. She said she had had a small swelling in this region for several years but it had never caused any trouble.

Frequently small strangulated partial enterocoelas are mistaken for a lymphatic adenitis and locked, with disastrous results. The operation was done under local anesthesia. Small femoral hernias lend themselves readily to the local method. A series of wheals along the line of the proposed incision was all

eventful and she will be discharged from the hospital in a few days.

Partial enterocele was first observed by Fabricius Hildanus in 1598 and was clearly described by Lavater in 1672. Various authors have described this condition but the most important of the early papers was published by Richter in 1799 from whom this hernia takes the name most often applied to it. Later important papers were contributed by Meckel, Riecke, Wagner, Kocher, Defant, Treves, De Baumbis, Adam and Vires. Sawyer in 1921 reported a case and reviewed the literature on the subject.

In partial enterocele the constricted portion of gut becomes distended, swollen and may retain its deformity some time after the constriction is relieved, presenting the appearance of a diverticulum. This false diverticulum of partial enterocele gave rise to considerable confusion among the early writers, even Littré mistook his 2 cases of hernia of Meckel's diverticulum for hernias of the intestinal wall.

The changes that take place in the constricted intestine are due to the cutting off of its blood-supply and to the distention of the gut as the result of the imprisoned intestinal contents. The distention of the constricted gut is always secondary to the onset of the strangulation.

Gangrene occurs earlier in partial enterocele than in ordinary strangulation. This fact is undoubtedly due to the direct pressure exerted on the gut by the constricting ring, in the absence of mesentery or omentum which by their elasticity act as a cushion or buffer, consequently delaying the onset of strangulation.

In partial enterocele the portion of the gut that is strangulated is the convex surface of the loop, the free border opposite the mesentery.

The mesentery does not enter the hernial sac and for this reason Roser in 1886 denied the existence of partial strangulation of the gut.

When intestine is adherent to the sac wall a sudden increase in intra-abdominal pressure may force the sac with its attached intestine through the constricting ring.

that was needed in this case as the sac was just beneath the skin. As you know Intestinal serosa is insensitive to heat, cold, pain, and pressure.

After carefully exposing Gimbernat's ligament, it was cautiously nicked, and then stretched with a hemostat, as suggested by Doyen. Only one third of the caliber of the gut was caught in the constriction and this accounted for the mildness of the symptoms. If you will look at the diagrams you can readily understand why the symptoms vary and depend on the amount of the gut circumference constricted (Fig 299). When almost the entire caliber is nipped the symptoms are similar to those of complete obstruction, and on account of this severity operation is seldom delayed. There is considerable difference of



Fig 299 —Diagrammatic sketch showing different degrees of partial external oblique.

opinion as to the results of the different operations. I believe the simplest operation is always the best.

As soon as the constricting ring was divided hot moist compresses were applied to the congested gut and in a few minutes its color returned and as it had preserved its "polish," it was returned to the abdomen.

Before the knuckle was replaced I pulled down the distal and proximal loops a short distance and inspected them. Proximal perforation above the constriction is sometimes the cause of peritonitis and death following an otherwise successful operation for strangulated hernia.

The usual operation for femoral hernia with suture of the femoral ring was performed. Her convalescence has been un-

symptoms, should be regarded with suspicion and treated by prompt operation without preliminary attempts at taxis.

If the intestine is viable as was the case in our patient, and no constricting furrow is seen the gut can be returned to the abdominal cavity. If there is gangrene, perforation, or signs of doubtful viability the gut should always be resected unless the gangrenous area is very small when it may be turned in and buried under a few Lembert sutures. Large patches of gangrene

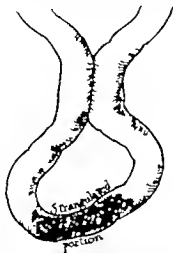


Fig. 300.—When the condition of the patient necessitates the formation of an artificial *proximal anastomosis* above the strangulated portion will usually result in spontaneous closure of the fistula.

should never be inverted because of the danger of postoperative stenosis.

When the patient's condition is grave, it is often best to do a two-stage operation. At the first operation the intestine is brought into the wound and a fecal fistula formed. At the second stage the fistula is closed and the hernia repaired.

Operation by the abdominal route is often advised as a time saver in strangulated partial enterocoele in the femoral, obturator or sciatic regions (Fig. 300).

A partial enterocele is most frequent in femoral, obturator and inguinal hernias rarely is it found in the umbilical and ventral varieties. Sawyer in 1921 and Baldwin in 1922 reported cases in which strangulation occurred in postoperative ventral hernias. Arnold in 1907 reported a case of fracture of the pelvis in a woman aged seventy-six years in which a portion of the intestine was nipped by the bony fragments of the horizontal ramus of the pubis. Considerable force was required to liberate the lacerated intestine.

The symptoms of partial enterocele are similar to those found in strangulation of the entire intestine with the exception that in partial enterocele constipation is not complete as some fecal matter and gas can pass the constriction in nearly all cases. Vomiting is sometimes absent and when present it seldom becomes fecal in character.

Local signs are often absent. If a swelling can be detected in the femoral or inguinal region, a diagnosis is easy. According to Treves the tumor is absent in 50 per cent. of the cases. In the majority of cases, however, no tumor can be detected, and the pain and tenderness over the strangulated hernia may be so slight as to pass unnoticed even by the patient himself as in the cases reported by Bernard and Lefran.

A partial enterocele in the femoral or inguinal region is often mistaken for an inflamed lymphatic gland, especially when the condition is accompanied by tenderness, a degree or two of fever and the typical symptoms of strangulation are lacking. Perforation into the sac may take place without serious symptoms developing.

The prognosis for strangulated partial enterocele is usually grave because gangrene develops early and operation is usually undertaken late on account of the mildness of the symptoms. The mortality rate is higher than in ordinary strangulated hernia.

The treatment for strangulated partial enterocele is the same as for other forms of strangulated hernia. Early operation is imperative. A small, tender, painful mass at one of the hernial openings, if accompanied by only moderate gastro-intestinal

EMBOLISM AND THROMBOSIS COMPLICATING HERNIA OPERATIONS

Frequency of Embolism and Thrombosis Following Hernia Operations. Treatment.

THE second condition I wish to discuss with you because it has a bearing on the operation just performed is that of embolism and thrombosis complicating hernia operations. Under this heading we shall consider particularly pulmonary thrombosis and mesenteric thrombosis.

Pulmonary thrombosis seldom occurs before the first week after operation, usually between the tenth and fourteenth day. Maclaur collected in the literature 50 cases of pulmonary thrombosis following inguinal hernia operations and of this number 12, or 24 per cent. were fatal. Lenormant collected 233 cases with a mortality of 45.5 per cent. The symptoms come on without warning and death may be almost instantaneous. The patient complains of a severe pain over the heart and suffocation and usually dies before medical assistance can be summoned. If the obstruction to the blood flow is not complete, he may live several hours, with rapid breathing and marked dyspnea and cyanosis.

Several years ago I operated on a man, fifty years old for right inguinal hernia. There were extensive omental adhesions in the sac, but no omentum was excised. Recovery was uneventful until the sixth day when he suddenly developed symptoms of pulmonary thrombosis and died within five minutes.

The treatment may be divided into preventive and operative. The principal preventive measures may be summed up as follows. The tissues should be handled very gently during the operation. rough retraction should always be avoided. the veins in the field of operation should be ligated carefully and injury to their intima painstakingly avoided. hemostasis should be complete before the wound is closed. The patient's knees should

CLINIC OF DR. GOLDER LEWIS McWHORTER

PRESBYTERIAN HOSPITAL

IMPACTED CALCULUS IN THE JUXTAVESICAL PORTION OF THE URETER; TECHNIC OF URETEROLITHOTOMY UNDER LOCAL ANESTHESIA

Patient Giving History of Recurrent Attacks of Pain in Left Kidney Region for a Period of Three Years. Non-operative Attempts at Removal of Stone Unsuccessful. Ureterolithotomy Under Local Anesthesia. Postoperative Course.

THE passage of a stone through the ureter is a common condition. Probably a large number of people have at some time passed one or more renal calculi. A number of these have a temporary or permanent lodgment of calculi in the ureter and at times with none or only indefinite symptoms. This has been possible of demonstration since the use of the Roentgen ray. The majority of ureteral stones produce pains but they may be of varying grades of intensity and referred to various parts of the abdomen so that they are often confused with other abdominal disorders. In the operative removal of a stone impacted in the lower ureter I wish particularly to demonstrate the technic of local anesthesia and the surgical anatomy of the lower portion of the ureter.

The patient on whom we shall operate this morning gives the following history:

Onset and Course.—First attack of soreness and pain over the left kidney region, non-radiating in character occurred three years and four months ago, lasting several days. During the second attack one year ago there were sharp cutting pains in the kidney region, lasting for one day. A third attack of pain

not be bent while on the operating table because the slowing of the blood-stream is an important etiologic factor and for this same reason patients with severe anemia should receive a blood transfusion before operation. Local infection is unquestionably an important cause and for this reason absorption areas should not be opened up any more than is necessary during the operation.

Meyer in an article published in 1921 advocated active exercise for hernia patients to be carried out while they are still in bed to speed up the circulation.

Because of the fact that death follows so quickly after the onset of the symptoms little is to be offered in the way of operative treatment. There are only a few instances recorded in the literature in which an attempt has been made to remove a pulmonary embolus by operation. Capelle in 1920 reported 2 cases in which the operation was unsuccessful. The results from the removal of an embolus from other arteries have been more favorable. Sundberg in 1920 collected in the literature 6 cases in which this had been successfully accomplished and reported one case of his own in which the embolus was removed from the femoral artery and the patient survived.

Mesenteric thrombosis is often associated with arteriosclerosis and the most important causative factors are probably disturbance in the blood-supply, trauma and local infection.

Mesenteric thrombosis may be venous or arterial. Venous thrombosis gives more indefinite symptoms and its progress is slower than arterial thrombosis, in which the symptoms often resemble those of acute intestinal obstruction. This variety has a greater tendency to spontaneous cure than arterial thrombosis.

Immediate operation is indicated when mesenteric thrombosis is suspected. If the mesentery is gangrenous, resection of the gut is necessary. If the patient's condition is critical, the intestine can be left in the wound, glass drainage-tube inserted and the intestinal contents allowed to drain.

pain, examination of the urine showed numerous pus-cells, but no blood. Cystoscopic examination was made to determine the source of the pain and pus. The bladder and the region of both ureteral meati were negative. The orifices of both meati were quite small. Apparently normal urine spurted from both sides. The right ureter was catheterized easily. There was an obstruction in the left ureter about 4 cm. above the meatus. With considerable difficulty and trauma a No 4 catheter was finally passed by this point of obstruction. A grating sensation could be felt. Bloody urine passed from the catheter. Specimens of urine from the bladder and both kidneys were examined. The cultures from the bladder were positive for colon bacillus, but were negative from both kidneys. There was no pus or blood found in the urine from the right side, pus was absent from the left side, but there were many red cells. A wax-tipped catheter was passed in contact with the obstruction in the left ureter and showed a definite scratch mark. Roentgenograms were then taken which showed a definite shadow in the region of the lower ureter.

This confirmed the diagnosis of ureteral stone determined by the use of the wax tip, the grating sensation, and the presence of obstruction. The patient was told that he might pass the stone following this manipulation and to strain all urine through gauze. He was instructed to drink large quantities of water and given hexamethylamin and benzoic acid alternating with alkalis every ten days. Since then manipulation through the cystoscope in an endeavor to loosen the stone by the injection of oil was done five times. It was impossible on most occasions to pass anything by the obstruction, but at times a No 4 catheter was passed with considerable trauma. On two occasions the rather small ureteral meatus was dilated up to a No 11 French size. This dilatation was only obtained with difficulty on account of the great resistance of the tissues about the ureter where it passes through the bladder wall. On two occasions 5 c.c. of a 5 per cent. procaine solution was injected into the ureter followed by the injection of oil. Owing to the difficulty of catheterizing the left ureter the absence of infec-

came six months ago. This was not a severe pain. It lasted one day and was more of a soreness than a colicky pain. Four months ago a fourth attack came on, lasting two days. This was a severe soreness, with excruciating pain over the region of the left kidney. There was no cutting pain or radiation. He stayed in bed one day but the pain persisted for several days, gradually getting better. No other symptoms accompanied these attacks. There was no blood, gravel, frequency, polyuria, dysuria, or anuria. The patient was Roentgen-rayed four months ago and has been under treatment since then for a stone which was found at that time to be in the ureter just above the bladder.

Past History—Patient had most of the childhood diseases, including scarlet fever from which he has a discharging left ear. Ten years ago the patient was operated on for a tuberculous right knee-joint. The knee joint was resected and the leg is now stiff. Previously he had had trouble with the knee for three years.

Veneral History—Patient had a neisserian infection three years ago followed by epididymitis and also had it the same time.

Family History—Mother is living and well. Father died of pneumonia, aged fifty. 4 brothers and 1 sister living and well. One sister died in infancy.

Physical Examination.—Patient is a rather poorly nourished and developed white male.

Head and neck are negative.

Chest.—Heart borders are normal and there are no murmurs. Lung borders are normal and respiratory excursion is good. There are no abnormal areas of dullness and no rales.

Abdomen.—There are no scars, tender areas, or rigidity. The liver and kidneys are not palpable.

Rectal examination shows slight thickening and irregularity of the prostate.

Lymphatic System.—No superficial groups can be palpated except the inguinal, which are about as large as buckshot.

Reflexes.—Eyes react to light and accommodation. Left knee-jerk is normal and there is no Babinski.

About four months ago several days after his attack of

may cause pain which is entirely limited to the kidney region. The reason for this variation is not clear but it may be due to the distention of the pelvis by some obstruction. The stone has been impacted for at least four months and possibly much longer. While the stone is of a size that might ordinarily be passed the ureteral meatus is quite small and the tissues about it are very resistant, so that the disproportion is great. Smears from the prostate have shown numerous pus-cells and a few bacteria. With a positive culture of colon bacillus from the bladder urine the possibility of introducing infection is considerable especially following repeated trauma from the continued use of non-operative methods.

Operation, therefore is indicated. The patient being rather frail and having a history of tuberculosis of the knee local anesthesia is preferable. The urine has been negative except for numerous pus-cells in a passed specimen. The hemoglobin is 90 per cent. white blood-cells 8200 blood-pressure 120/78. An hour ago the patient was cystoscoped, and a shadowgraph catheter was introduced up to the point of obstruction and a roentgenogram taken showing the stone still in position (Fig. 301). The localizing of the stone immediately preceding operation is an important point not a few patients have been operated after migration of the stone up or down the ureter or after it has been passed.

Operation.—I will use regional or block anesthesia employing $\frac{1}{4}$ of 1 per cent procain with adrenalin. The first injection is made at a point two fingers medial and slightly above the anterior superior spine of the ilium similar to the technic for a hernia operation. The needle is now passing into the deep layers of the muscles in order to catch the lumbar nerves. The point of the needle is changed to pass down almost to the ilium into the deep muscles through which the nerves pass. The needle is inserted in a fan-shaped manner for several injections so that this region at right angles to the course of the nerves is thoroughly infiltrated. The needle is now turned upward toward the umbilicus infiltrating the various muscle layers first and then superficially. This regional injection is now

tion and the normal secretion of urine, a functional test was not made.



Fig. 301.—This roentgenogram, as taken the same day immediately preceding operation, in order to be certain the calculus had not migrated. The opaque catheter is against the impacted calculus. This is just beyond the bladder. *ab*. The coil in the catheter gives partial outline of the bladder.

The patient had symptoms of calculus for almost three and a half years. All of the pains were over the region of the kidney posteriorly so that it was impossible to tell how long the stone had been in the ureter. We know that ureteral stones

down to the branches of the superior vesical artery. As the base of the bladder is approached we see what resembles the ureter. This is traced to the bladder but it passes along it posteriorly toward the midline, and we identify it as the ductus deferens. It is lifted up carefully and retracted in order to avoid injury to the branches of the superior vesical artery which pass laterally. Kidd states that occasionally it may be necessary to cut the hypogastric ligament or even the superior vesical artery and strongly retract the ductus deferens upward and outward. The bladder is now followed farther down by retracting the peritoneum upward. Just beneath the region of the ductus deferens near its point of approach to the bladder a blunt forceps is used to dissect along the loose fat over the peritoneum in a line with the direction of the ureter. The ureter is normally carried up with the peritoneum. This immediately discloses a structure which undoubtedly is the ureter we having already identified the ductus deferens above. We easily dissect it down toward the base of the bladder.

Just before it enters the bladder wall we see a decided enlargement and discover a hard mass which proves to be a calculus. A soft clamp is now placed higher up in order to prevent the calculus from slipping up when we attempt to remove it. On palpation, the calculus is found firmly impacted and resists any attempt to move it up or down in the ureter. It is lying just above the entrance of the ureter into the bladder. The ureter is well exposed in the field and available for any operative procedure. There is no hemorrhage, due to our care in the deep dissection. A small cut is now made into the ureter over the upper part of the oval-shaped distended portion (Fig. 303). The stone is removed by delivering it end first through the incision. A few fine catgut sutures are placed in the sides of the ureter in order to close the incision, catching only the outer layers of the ureteral wall. The clamp is removed from the ureter and a folded piece of rubber-dam is placed down to the region of the ureter. A cigarette drain is placed in the space of Retzius and the fascia closed with catgut. A few interrupted silk-worm-gut sutures are put through the skin and fascia to-

carried beyond the umbilicus to the outer border of the right rectus muscle and then down to the pubes. This line of injection is now carried back along Poupart's ligament to join the original injection (Fig. 302). The patient is placed in a Trendelenburg position.

A suprapubic midline incision is made in the paramedial fibers of the left rectus muscle similar to an ordinary cystotomy

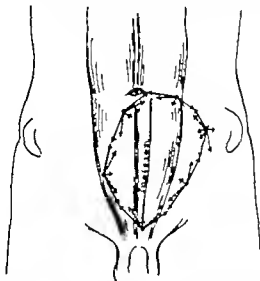


Fig. 302.—Regional method of local anesthesia. The dots indicate the puncture points. The dotted and broken arrows indicate the deep injections to form block anesthesia. The solid arrows indicate infiltration of the superficial tissues.

incision. The bladder has not been distended with fluid, since that is not necessary or desirable. It is found by following the peritoneal reflection down close to the pubic bone. It is readily recognizable by its muscle-fibers and the peritoneum is reflected away from above the bladder which is not to be opened. The left outer side is now followed down to its base.

The first landmark seen is usually the obliterated hypogastric artery. This is associated with the peritoneum and leads us

gether and the skin is closed with silk. The calculus is somewhat pear shaped and has a very rough surface studded with minute projections. It measures 1.2 cm. long by 0.9 cm. wide.

Postoperative History—There was some urine discharge for a few days until at the end of a week there was apparently no urine in the small amount of discharge coming from the wound where the drainage tubes had been removed. The tubes were shortened several times before removal. The remainder of the wound healed by first intention. The skin stitches were removed at the end of a week and the silkworm-gut at the end of twelve days.

A postoperative cystoscopic observation was made six months later. The patient had no complaint and had put on weight since the operation. The bladder was negative. A No. 6 catheter was passed into the left ureter without any difficulty; there was no evidence of a stricture or a narrowing of the ureter; urine secretion was normal. Phenolsulphonephthalein appeared in the urine from the left kidney three minutes after intravenous injection. In the first fifteen minutes there was an output of 10 per cent. from the left kidney. Urine examination from the bladder showed a cell count of 211 cells to 1 c.mm. and cultures were negative. There was a cell count of 280 cells to 1 c.mm. from the left kidney and the cultures were negative. The right ureter was not catheterized since secretion appeared normal.

In the discussion of operations on the ureter we shall limit ourselves to a consideration of calculi located in the ureter. As to the frequency of operations as compared to the number of ureteral stones treated by non-surgical methods, the statistics reported by Judd and others include cases over a number of years before the development of non-operative methods. Judd reports 400 patients operated for ureteral stone as compared to 126 patients treated by non-operative methods. In 198 of those operated the stones were in the lower third of the ureter. Braasch states that it is inadvisable to operate on stones in the ureter for at least three months unless there is a definite indication for operation. In cases of low renal function with bilateral

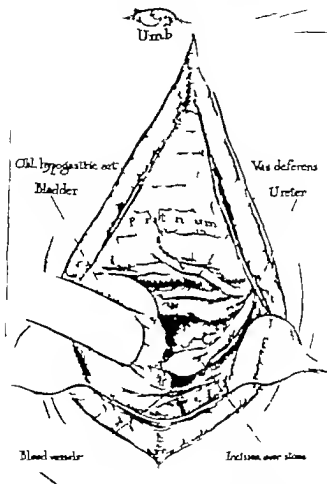


Fig. 303.—The various structures in the suprapubic extraperitoneal approach to the lower ureter are shown. The peritoneum is reflected up, exposing the bladder which is followed down laterally to its base. The hypogastric ligament and the ductus deferens are usually the first landmarks seen. The ureter may be well exposed in this manner. The soft jawed clamp applied to the ureter above the stone, to prevent slipping up, is not shown. A small incision is made in the ureter over the upper end of the stone, which is removed in its long axis.

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kidney and ureteral stones operation is usually contraindicated. He states that operation is indicated in ureteral stones larger than 2 cm., acute impaction with continuous obstruction, acute renal infection, intolerance to cystoscope, and anatomic deformity. Bevan says that stones no larger than a coffee berry usually pass.

It is reported by Bugbee that only 15 out of 107 cases of ureteral calculi were operated. Kidd gives a series of 20 consecutive cases where 15 ureteral stones passed naturally and 5 were operated. He found experimentally that a stone can lie in the ureter not longer than six months to a year before damaging the kidney irreparably. Clinically he puts no definite time limit, but advises waiting *six months*, using non-operative methods during that period. He states that the wall of the ureter at site of impaction undergoes fibrosis and stenosis. The ureter above becomes dilated and sooner or later bacteria filtering through the kidney from the blood produce infection. Later abscess may form around the ureter. Infection of the kidney and anuria may develop with destruction of the kidney. In several cases operated by Judd the stone was lying in an abscess outside the ureter. At operation he states the ureter in many cases appeared normal in size and appearance and yet the stone seemed to fill the lumen. Spontaneous perforation of the ureter by a calculus may result in death, as in a case reported by Berry where sepsis and death followed a perforation by a calculus. There was a calculus also in the opposite ureter and a double pyelonephrosis.

In this case the stone is seen to be rough and resembles a mulberry. This rough, irregular surface was probably what permitted the urine to filter around it among the projections, while the stone was held tightly by the wall of the ureter.

The accurate diagnosis of ureteral calculi by the Roentgen ray alone, Braasch and Moore state, is possible in only 60 per cent. of cases on account of extra-ureteral shadows and stones which for some reason do not show on the films. In 8 cases of calculi in the ureter reported by Braasch and Thomas where the roentgenograms and the cystoscopic evidence were doubtful,

positive diminution in comparative secretion was found in 2 cases. They state that marked reduction in the renal function test is not usually found in the absence of dilatation of the pelvis or infection. Geraghty and Hinman state that in a series of 67 cases radiography missed the calculus in 22.4 per cent. They state that the wax tipped catheter excels in accuracy any known method. They report a diagnosis of 6 cases where the Roentgen ray was negative and only 1 case where the wax tip failed. Kretschmer has found the double exposure on the same roentgenogram to be of value for differentiating extrinsic ureteral shadows.

In cases where there is no immediate indication to operate and where the stone may pass through the ureter non-operative methods are indicated. With the development of the operating cystoscope there has occurred a rapid increase in intravesical maneuvers to remove calculi impacted in the ureter. This has led to the instillation of drugs papaverin, novocain, oil, and the injection of fluids in large quantities above the stone. Good results are reported from many methods and various drugs (Fowler Merritt). However manipulation against the calculus is involved in all these procedures and usually distention of the ureter. Braasch states that the manipulation is the important factor. This may be aided, I think, by the mechanical action of the fluids and oil injected at the same time. Braasch states that approximately one-half of the stones in the lower ureter that will not pass spontaneously can be removed successfully by non-operative measures.

Bugbee states that 50 per cent. of ureteral stones pass by themselves and 75 per cent. pass after manipulation. Dilatation of the ureter at its outlet is often of great value and cutting the mucous membrane where the stone is intramural may be all that is necessary. Young advocates enlarging the meatus by means of the high-frequency current for intravesical and intramural calculi. Where the stone is above the bladder wall there is danger in cutting through into the paravesical structures. Bugbee describes a trick of coiling a ureteral catheter around a stone and pulling it out. He states that in one case he was un-

able to get the catheter out after this procedure so that it is not without danger.

There are comparatively few reports of late results from operative treatment of ureteral stones. Fowler lists 24 operative cases of stone impacted in the lower end of the ureter in the male up to 1904 which include 2 of his own. The mortality given by Judd in 400 operated cases of ureteral stone was one death due to operation. Bugbee states that 1 case of 15 operated died six weeks after operation. McNeill describes 2 cases of inflammatory stricture of the right ureter due to a pelvic abscess following ureterotomy of the left ureter. In one case this led to a kidney tone and nephrotomy. Kretschmer lists the complications as stricture, infection, destruction of kidney and death. Of the 400 operated cases reported by Judd there was a recurrence of ureteral stone with operation in 3 cases, and in 4 cases a later nephrectomy was done on the operated side. There was complete relief reported in 90 per cent. of the cases. 26 of these operated cases have passed stones since. Judd reports 1 out of 28 operated cases where stricture followed operation and a nephrectomy was necessary.

The bad results from operation, we see, are rather few in spite of the fact that cases operated are the more serious ones. Certainly serious results may follow prolonged impaction with obstruction of the ureter. While non-operative procedures are of great value in many cases as outlined above Judd states that they may be carried too far since there is danger of trauma of the ureter and bladder and infection of a normal kidney.

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CLINIC OF DR. GEORGE E. SHAMBAUGH

PRESBYTERIAN HOSPITAL

THREE CASES OF LABYRINTHITIS SECONDARY TO CHRONIC SUPPURATIVE OTITIS MEDIA

Presentation of 3 Patients Suffering from Labyrinthitis Secondary to Chronic Suppurative Otitis Media. History, Diagnosis, and Treatment.

CASE I

THE first case is that of a man thirty-seven years old who consulted me first in 1915 because of a discharge from both ears which had persisted since an attack of scarlet fever in childhood. During these years the discharge had been continuous except for short intervals when there was an apparent cessation. For the past eight months the discharge had been continuous and much more profuse, brought on as the result of swimming in cold water.

The examination disclosed a central perforation in the right drum membrane and a discharge more mucousy than purulent. In the left ear the perforation extended to and eroded the bony margin in the upper posterior quadrant. In this ear the discharge had the offensive odor characteristic of a bone invading process.

The hearing in both ears was depressed—the whispered voice being heard in the right ear at a distance of 1 meter and in the left ear at 2 meters. The defect had all the characteristic reactions of an obstructive middle-ear lesion. There was a marked elevation of the lower tone limit with a relatively slight defect for the higher tones and, of course, a Rinne negative.

It was clear that the process in the two ears was quite different. In the right ear there was every reason to believe that

the disease was involving only the mucous membrane of the middle-ear chambers while in the left ear it was equally clear that we had to do with a bone-invading process. The question of treatment was very easily settled as regards the right side. Here where the disease was restricted to the mucous lining of the middle ear the question of an operation did not have to be considered, for the simple reason that there was little or no probability of any of those serious complications developing which endanger the patient's life. In conditions of this sort one is justified in limiting the treatment to local, non-operative measures indefinitely. One is not warranted in advising the radical mastoid operation merely to check the persistence of discharge when it can be definitely ascertained that the disease causing the discharge is not a serious menace to the life of the patient. There are very good reasons for restricting the radical mastoid operation to only those cases where the middle-ear disease is a distinct menace as distinguished from the annoyance of the discharge. These reasons are that the operation itself even in the hands of an experienced operator is not without more or less serious risks. One of these is the risk to the hearing. There is always the possibility of the margin of hearing being seriously reduced as the result of scar formation in the region of the labyrinth window. Then there is always to be considered the danger to the facial nerve in performing the radical operation. A patient who permits the radical operation for the purpose of checking a discharge when the middle-ear disease has no more serious outlook would hardly relish having in exchange for the annoyance of the discharge to put up with the disfiguring facial paralysis for the remainder of his life. One must also consider the ordinary risk incurred from any major operation requiring more or less prolonged anesthesia.

The problem of treatment in the case of the left ear in this patient was quite a difficult matter. It was apparent from the examination that the infection causing the discharge was not restricted to the mucous lining of the middle-ear chambers. From the marginal character of the perforation as well as the character of the discharge it was apparent that we had in this

ear a bone-invading process probably a cholesteatoma. This type of chronic, suppurative otitis media is not without risk of more serious complications which may sooner or later invade the labyrinth, resulting in a complete destruction of the hearing function. More than this, it is this form of chronic suppurative ear disease from which develops so frequently the more serious intracranial lesions which often cost the life of the patient, such as sinus thrombosis, meningitis, or brain abscess. It is only in this type of chronic middle-ear suppuration existing in the left ear that one is called upon to consider the question of advising a radical mastoid operation. The decision to operate is, however, not so easily reached as might be inferred from the above statement of the proper indications. For example, in a case like the one which we are here discussing, where there is a more serious impairment of hearing in the opposite ear that is, where the patient relies chiefly on the ear for which we are considering the advisability of operating one proceeds quite differently than when the opposite ear is the better hearing ear. The reason for this is quite plain. If we are planning to operate on the one ear on which the patient has to depend for hearing, the indication for the operation naturally should be much more urgent than when the reverse is true. The proper indication for operating on the one ear on which the patient relies for hearing is when a serious complication is really imminent. To decide this question requires a more careful study of the situation. For example when the discharge is profuse it is evident that the disease is progressing more rapidly than when it is slight and, of course the danger of a complication is more imminent in a rapidly progressing disease. When there is a persisting one-sided headache restricted to the side of the ear under consideration this should be regarded as an indication of an impending intracranial complication where the delay in carrying out the radical operation may cost the life of the patient. It is apparent that under circumstances of this sort the question of a possible increase of the deafness as the result of the operation must not cause delay.

In this particular patient after cleaning out the ear and directing him how to keep the ear clean, I gave him a solution

of alcohol 95 per cent. saturated with boric acid with directions to instill at least $\frac{1}{2}$ teaspoonful of the solution (warm) in the ear each day for two weeks, and at the end of that time to return for final advice as to whether we should continue local treatment or whether the operation should be undertaken. As happens so frequently in these cases the patient did not return.

I did not see him again until January 12 1922 when he came complaining of vertigo of two weeks duration associated with an appreciable depression of the hearing in the left ear which had been his better hearing ear. He was not annoyed with tinnitus or earache but attributed the deafness and the vertigo to a temporary cessation of the discharge. He had accustomed himself to the use of an artificial ear drum which he used in each ear finding that this device increased the hearing very much in both ears, but particularly in the left.

The examination disclosed about the same situation in the right ear as when first examined seven years ago. In the left ear a mass of granulation was seen protruding from the perforation in the upper posterior quadrant. The slightest pressure on these granulations brought on a violent nystagmus with some sensation of vertigo. Compression of air in the external meatus or suction caused no response. The nystagmus was exactly in the horizontal plane with the slow component to the right and the quick movement toward the same side that is, to the left. On applying continuous pressure the nystagmus gradually diminished and invariably disappeared completely before one minute. The release of pressure was not noticed to produce the reversed eye movements.

The diagnosis was clearly one of fistula in the horizontal semicircular canal where this canal forms prominence in the floor of the aditus. The reason one is able to fix so definitely on the location of the fistula is because of the well-known laws governing the movements of endolymph in the several canals. One of these is the law governing the eye movements occasioned by endolymph currents. Experiments first carried out on pigeons by Ewald have shown that movement of endolymph in a semicircular canal produces eye movements restricted to the

plane of the canal being stimulated. In this case the horizontal character of the nystagmus showed that the endolymph movement resulting from pressure on the polyp mass in the tympanum took place in the horizontal canal. Another law governing the eye movements is that the slow component of the nystagmus is always in the direction of the endolymph current. In this patient pressure on the polyp mass located in the left ear drew the eye slowly on to the right side with the quick component of the nystagmus directed to the left. Now in order to get this movement of the eye it is necessary for the endolymph movement in the left horizontal canal to be from the left toward the right, that is, from the small end of the canal toward the ampulla.

Further functional examination disclosed no evidence of a spontaneous nystagmus. There was, however a marked depression in the hearing for the left ear. In the first place the lateralization of the tuning fork placed on the median line of the head was always to the left. This was very significant, as the tests for air conduction in the left ear showed practically a complete suppression of function for the several parts of the scale. There was no perception for the voice detected in this ear.

It was evident that in addition to the fistula in the horizontal canal we had to do with a diffuse labyrinthitis which had resulted in a very marked depression of the function. The situation was indeed, critical. There was present in this case a type of chronic suppurative middle-ear disease in which the radical mastoid operation is clearly indicated. In addition, this man had a serious labyrinth complication that had to be considered. The labyrinth disease had resulted in a profound depression of function, but not in the complete suppression, as evidenced by the lateralization of the Weber test to the affected ear and the presence of a positive fistula response that is the nystagmus produced by pressure on the granulation in the tympanum. Before proceeding with the radical operation on the mastoid it seemed best to allow the more or less acute labyrinth involvement the opportunity of subsiding.

Everything went along without any further disturbance until the first of February when on waking the patient observed

a severe, pulsating, hissing sound in the left ear and on getting up noticed more or less vertigo with some nausea. Actual vomiting took place during the early morning. Toward noon, with the assistance of his brother he came to my office. I noticed at once the presence of a spontaneous rotary nystagmus toward the *opposite* side which did not disappear even with the eyes turned strongly toward the left. There was also a positive Romberg the patient falling toward the left. The nystagmus brought out previously by pressure on the granulations had entirely disappeared, and finally the tuning-forks in making the Weber test were lateralized strongly to the right side. Further testing of the vestibular mechanism had to be restricted to the turning tests, for from the beginning the probability of eliciting a caloric response was excluded because of the mass of granulation filling the fundus of the canal. The turning test at this time brought out the same response as it had on January 12th. On turning the patient ten times to the right, the after nystagmus to the left lasted but five seconds and was extremely weak. On rotating him to the left the after nystagmus lasted seventeen seconds and was quite vigorous. This is the response invariably obtained in the early stages after a complete suppression of function in one ear.

When the patient was seen on February 1st quite a different situation had developed. It was apparent that the *diffuse* labyrinthitis that had caused a depression of function in the end organs of the labyrinth had now produced a complete suppression of this function. What did this change signify? The answer to this question was of great importance as will soon appear. There were two possible conditions: one was that of a severe diffuse serous labyrinthitis and the other was a diffuse suppuration of the labyrinth. These two conditions might result in the complete suppression of function, but in other respects the two processes are dissimilar. In the first place in a serous labyrinthitis there is the possibility of at least a partial return of function, whereas in the case of suppurative labyrinthitis the suppression of function is not only complete but the loss is permanent. There is another even more important differ

ence between these two processes. The condition of serous labyrinthitis rarely perhaps never leads to a serious intracranial complication, whereas in diffuse suppuration of the labyrinth there is always grave danger of an extension intracranially with fatal termination either from a meningitis or a brain abscess. There are three channels along which such an extension may take place. One is along the internal meatus, the second, along the aqueductus vestibuli and the third, along the aqueductus cochleæ. The decision as to which of these two processes was at work in this case was of great importance for the reason that if we decided that a diffuse suppuration had invaded the cavities of the labyrinth the proper advice would be to urge upon the patient an immediate operation which would combine with the radical mastoid the proper opening and drainage of the labyrinth itself. On the other hand, if we decided that the process was one of diffuse serous labyrinthitis with complete suppression of function, it would be better to defer operation on the mastoid until a subsidence of the acute labyrinthitis. If after a month or two there should be evidence of even a partial return of labyrinth function, one should restrict the operation to the radical mastoid. Should on the other hand, the tests show a persistence of complete loss of function, the radical mastoid operation could with entire justification include the opening of the labyrinth.

The danger of an intracranial extension in cases of acute suppuration of the labyrinth is greatest during the first week of the labyrinthitis. If nothing develops during that period the infection is likely to remain limited to the cavities of the labyrinth for the reason that the several channels through which an intracranial extension takes place become walled off. This is the explanation of the clinical observation that to open the labyrinth which is the seat of a chronic suppuration in the course of a mastoid operation is much less dangerous than the accidental opening of a normal labyrinth when operating on the mastoid. In the latter circumstances the resulting acute labyrinthitis is very prone to lead quickly to a fatal intracranial disease.

In the patient we are here discussing we concluded that we were dealing with a diffuse serous labyrinthitis which had proceeded to the stages of complete suppression of the labyrinth function. Our reason for this conclusion was that when the patient first consulted us on January 12th there was present a diffuse labyrinthitis which was causing only a partial suppression of function. This was clearly not a suppurative form of labyrinth inflammation, else there would have developed quite promptly a complete destruction of all function. This serous labyrinthitis persisted for at least four weeks before it terminated in the total suppression of function. Now a serous labyrinthitis is no more prone to change into the suppurative type than is a serous otitis media likely to change into the suppurative form of otitis media. One cannot state that such a change never takes place but when it does occur it does so as the result of new infection. On the basis of our conclusion that this was a case of serous labyrinth disease we have deferred the radical operation on the mastoid until the acute labyrinthitis has had ample time to subside.

CASE II

The second case of labyrinth suppuration presents another series of clinical problems which we have to face in handling this serious complication.

The case is that of a man thirty-nine years old who came to the Central Free Dispensary last month complaining of vertigo of a few weeks duration. He gave a history of a chronic discharge from the left ear of many years duration original cause of the suppuration not known.

The examination disclosed a normal condition on the right side. From the left ear there was a purulent discharge with the offensive odor so characteristic of cholesteatoma. The perforation in the drum membrane was located in the upper posterior quadrant and was associated with distinct erosion of the bony margin. A mass of granulation occupied the opening in the membrane. Compression of air in the external meatus brought out the characteristic symptom of fistula in the

labyrinth. The nystagmus produced by compression was of quite a different character from that observed in the first case. In the first place it was rotatory instead of horizontal and in the second place the direction of the quick component was toward the opposite side. On applying suction a slight reverse nystagmus was elicited. There was no spontaneous nystagmus.

The functional tests showed normal hearing in the right, with a profound depression in the left. The Weber however was lateralized to the left in spite of the fact that the profound depression throughout the upper tone range clearly indicated alteration in the labyrinth in addition to the defect resulting from the obstruction in sound conduction caused by the long standing middle-ear discharge. The rotatory character of the nystagmus produced by compression and suction in the external meatus resulted from endolymph movements in the superior semicircular canal, rather than in the horizontal canal, as in the previous case. Now there are two possible explanations for the occurrence of endolymph movements in the superior canal when applying this so-called fistula test. One explanation is that there exists an actual fistula in the superior canal where this lies exposed in the inner wall of the aditus as is occasionally found. The other explanation is that the fistula into the labyrinth is the result of an opening in the region of the oval window that is, an erosion through the foot plate of the stapes. With a fistula in the superior canal the direction of the flow of endolymph occasioned by compression would be toward the ampulla. This is the direction of endolymph current occasioned by irrigation of the ear with cold water with the head upright. The resulting nystagmus would, therefore be the same for both tests, that is the quick component will be toward the opposite side. This was the type of nystagmus observed in this case. Supposing the fistula had been located in the region of the oval window—compression of air in the external meatus would probably result in a flow of endolymph in the superior canal from the vestibule toward the ampulla. This direction of endolymph current in the superior canal would be upward, that is the direction of flow occasioned by irrigating the ear with warm water

The resulting nystagmus would, therefore, have the quick component directed toward the same side. It seemed to us therefore that the location of the fistula in this case was in the superior canal and not at the oval window.

Two weeks later this patient returned to the dispensary apparently quite ill. His temperature at that time was 101° F. He looked pale and complained of a severe headache. He made the statement that his illness came on three days ago and was associated with an attack of vertigo, nausea, and severe pulsating tinnitus. The examination disclosed a slight rotatory nystagmus toward the opposite side. The Weber was now lateralized to the sound ear and our tests failed to disclose any evidence of hearing function in the left ear. The fistula symptom had completely disappeared. On applying the rotation tests we got the following responses. On turning the patient toward the right the nystagmus was toward the left, on stopping rotation was very weak and lasted barely five seconds. On turning him to the left the after-nystagmus was much more vigorous and lasted ten seconds. The difference is accounted for as follows. Both responses, that is, after rotation to the right as well as to the left, resulted from endolymph movements in the horizontal canal of the sound ear that is, the right labyrinth. Now on turning the patient toward the right, the endolymph current on stopping rotation strikes the side of the crista toward the utricle, which is the less sensitive side of this crista, and the stimulation of the hair-cells in this side of the crista produce the nystagmus with the quick component toward the left, but the nystagmus is very weak for the reason just given. After rotation toward the left the endolymph current in the left horizontal canal is from the canal toward the crista, thus stimulating the hair cells on the more sensitive side of this crista which produces a nystagmus with the quick component directed toward the same side.

I have gone into these reactions rather minutely for the purpose of illustrating how complex the problem becomes of interpreting correctly the phenomena of labyrinth disease. Upon the correct interpretation of this phenomena hinges the all-important

question of what action shall be taken in the treatment of the condition.

It was apparent in this case that there had developed a diffuse labyrinthitis with complete suppression of function. From the symptom of headache and elevation of temperature it seemed probable that we had to do with a suppurative form of labyrinth disease rather than with a serous labyrinthitis. Furthermore the headache and elevation of temperature for which we could discern no other cause than the suppurative ear disease suggested the probability of a beginning intracranial extension, the complication most to be feared in cases of acute suppuration of the labyrinth. The patient was, therefore placed in the hospital. The spinal puncture made that evening found a turbid fluid caused by a great increase in the cellular count. There did not appear to be any great increase in pressure nor did we discover any of the characteristic reactions of a diffuse meningitis. It was apparent the patient was in a most critical situation, the result of an intracranial extension of the suppuration in the labyrinth, that this condition, if not immediately checked would result in either a cerebellar abscess or a diffuse suppurative meningitis was an imperative indication for surgical interference consisting of a radical operation for the exenteration of the disease in the antrum and tympanum followed by the free opening of the labyrinth in order to establish satisfactory drainage in the hope of checking a further intracranial extension.

The operation was undertaken the following day. A cholesteatoma was found lodged in the antrum attic and aditus. Careful search was made for a fistula in the superior canal but this was not detected, but this might be expected as this canal is not placed as exposed and therefore not so easy of observation as is the horizontal canal. The labyrinth was opened, but no effort was made at an exenteration of this structure. The opening back of the ear was not closed as in the ordinary radical mastoid operation. On the following day we detected a perceptible inequality in the action of the facial nerve. There was a distinct though partial loss of function. This condition persisted about the same during most of the first week which we

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cells on one side of each crista are more sensitive than are those on the opposite side. This fact, considered in connection with the laws expressed above means that those half-cells the stimulation of which results in movements toward the opposite side gives a more vigorous response than the opposite group. If we have these facts clearly in mind, and remember that a constant stream of tonus impulses are continually emanating from the end organs in the several cristae to the skeletal muscles, it becomes apparent, first, that these impulses from a single canal stimulate muscles causing movements in the two directions, and second, that the stronger impulses are those which produce movements toward the opposite side. The result, therefore of the combined tonus impulses from the right labyrinth causes movements toward the left and the combined impulses from the left labyrinth movements toward the right. Normally the impulses from the two labyrinths are equal and the result is an established state of equilibrium. Suppose now that something suppresses the tonus impulses from the one labyrinth, as in these 2 cases of diffuse suppuration of the labyrinth an unbalance is at once set up causing the symptom of vertigo with the tendency for the patient to fall toward the diseased side. This is exactly the phenomena observed in these 2 cases.

There still remains to explain why it is that after but a few weeks this disturbance of equilibrium largely disappears, although the loss of function causing the disturbance of equilibrium persists. The explanation of this phenomena is that there is in the first instance a rapid development of the extralabyrinth tonus to re-establish equal tonus from the two sides. In the second place there takes place sooner or later a tendency for an equalization of the responses from the half-cells on the two sides of the crista in the remaining normal labyrinth. This is shown by the fact that in time the responses aroused from the endolymph currents in the two directions in the canals of the normal labyrinth re equal. This fact is shown more readily when applying the turning tests. For example, in a case where the left labyrinth is destroyed, turning the patient to the right results in an after nystagmus exactly as vigorous and lasting as

attributed to some bruising of the nerve where it passes through the tympanum, especially likely to occur immediately above the oval window. Before the first week had passed this paresis developed into a complete paralysis, and so it has remained. One week after the operation a spinal puncture was again made and the fluid was found to be quite normal. The headache and the elevation of temperature disappeared a few days after the operation. He has made a complete recovery except for the persistence of the facial paralysis and the total loss of function of the internal ear. He is not annoyed with vertigo and is not conscious of any disturbance of equilibrium.

It will be appropriate here to discuss briefly the cause of the vertigo in these cases and the reason why this symptom is transitory in spite of the fact that the loss of function in the labyrinth is permanent, whereas the deafness persists. The symptom of vertigo is but the expression of unbalance resulting from the unilateral suppression of labyrinth tonus. The normal preservation of equilibrium is due to tonus impulses to the skeletal muscle. These tonus impulses are in part extralabyrinthian, but normally the more important source of tonus is from the end organs in the semicircular canals. There are some very definite facts regarding the tonus impulses from the labyrinth. These facts are found in the following laws regarding endolymph currents. First, an endolymph current in a semicircular canal stimulates the skeletal muscle producing movements in the plane of that canal. Second, the motion produced by an endolymph current is not only in the plane of the canal stimulated but is in the direction of the endolymph current. Third, the greater response is from those endolymph currents which stimulate muscles causing movements toward the opposite side. In order to understand these results of endolymph currents it is necessary to visualize the position of the several semicircular canals in the head. The endolymph currents in one direction stimulate the hair-cells on one side of the crista while an endolymph current in the opposite direction stimulates the hair-cells on the opposite side of the crista. This fact taken in connection with the law expressed above means that the hair

a prompt though not violent horizontal nystagmus in which the quick component was directed to the opposite side. On applying the usual fistula test, that is the compression and suction of air in the external meatus, we got the positive response for a fistula. The response however was not typical of a fistula in the horizontal canal, for with pressure there developed a rather weak horizontal nystagmus with the quick component directed toward the opposite side and with suction there was a much more violent horizontal nystagmus in which the quick component was directed toward the same side. This is exactly the reverse response to the one usually elicited from compression and suction. The production of this nystagmus increased the nausea and the desire to vomit from which the child had been suffering continuously for one whole week. There are two possible explanations for this reverse type of nystagmus on applying the fistula test. One is that the fistula symptom is the result of a relaxation of the attachment of the stapes in the oval window or of the development of an actual fistula in the region of the oval window. The other is that a fistula is located in the typical situation, that is where the horizontal canal forms a prominence in the floor of the aditus and that on account of a valve-like action of the granulations about this fistula the currents set up in the endolymph on compression and on suction were the reverse for that ordinarily produced in a fistula in this location. Caloric responses elicited by the blowing of compressed air into the external meatus on the right side brought out quite promptly the typical rotatory nystagmus directed toward the opposite side.

In view of the apparent complete suppression of the function of hearing in the right ear we had at first feared that there had developed in this ear a diffuse suppuration of the labyrinth and that the persisting vomiting might be the result of a cerebellar lesion so much dreaded in cases of acute suppuration of the labyrinth. The discovery of a functioning vestibular mechanism was therefore a great relief since this excluded the existence of diffuse suppuration of the labyrinth the one type of labyrinthitis from which an intracranial complication is at all probable. The child was exhausted as the result of the

many seconds as when turning him to the left. The whole process is somewhat complex, yet one the exact working of which we have very accurate knowledge.

CASE III

The third case of labyrinthitis secondary to chronic suppurative otitis media occurred in a child seven years old. She was brought to me on December 10 1921 complaining of persisting nausea and vomiting associated with severe headache of over one week's duration. There was a history of an attack of scarlet fever eleven months previous which was complicated by a bilateral acute otitis media. That there had been any discharge from the ear previous to the attack of scarlet fever could not be ascertained. Eight weeks after the onset of the scarlet fever she developed an acute mastoid abscess on the left side for which a simple excision of the mastoid process had been undertaken. There had persisted during the eleven weeks following the scarlet fever a continuous though not profuse discharge from both ears.

On examining the patient December 10th there was found to be an extremely offensive discharge from both ears such as is only found in cases of extensive cholesteatoma formations. In both ears there was a total loss of the drum membrane and in both there was the characteristic erosion of the margin of the bony meatus in the upper posterior segment characteristic of a bone in ridding process. There were no granulations in the fundus of either meatus, but there was no difficulty in discovering the characteristic masses of cholesteatoma. The functional tests of hearing disclosed no hearing for the whispered voice in the right and a hearing distance of about 1 meter in the left. The Weber however was lateralized distinctly to the right. In testing the tone scale in the right ear was not able to discover that any of the forks were heard up to and including the c (2048 d.v.) There was present rotatory nystagmus on looking toward either side. This seemed to be as pronounced on looking to the left as toward the right. Pressure with a pledget of cotton applied to the upper posterior segment in the right ear produced

called for. Where the indication for the radical mastoid operation exists for both ears, only one should be subjected to the operation, and that should be the one where the hearing is the poorer. Later the opposite ear may be operated depending largely on whether the hearing in the operated ear has become good enough to warrant subjecting the second ear to the jeopardy of the radical operation.

These 3 cases of chronic suppurative otitis media each complicated by a cholesteatoma and each with an erosion into the labyrinth, the so-called fistula, differ widely in their clinical problems for the otologist. In one an immediate operation including drainage of the labyrinth, had to be carried out. In another no operation at all has as yet been done and in the third the radical mastoid has resulted in an elimination of the chronic disease involving the bone and has resulted in a marked improvement in the hearing. I have reported the cases because they illustrate very well how complicated are the problems in these cases of chronic middle-ear discharge and how differently cases that resemble each other rather closely have to be handled. The clinical problems which confront the otologist are more complex and require more careful analysis than do the problems in any other special field.

constant nausea with vomiting which had prevented her from retaining food for more than a week. The cause of the persisting nausea we attributed not so much to the existence of the fistula into the labyrinth as to a condition usually termed "perilabyrinthitis," in which an irritation of the labyrinth is kept up as the result of the extensive cholesteatoma. The radical mastoid operation was immediately carried out. The cholesteatoma was very extensive, invading the bone in all directions up into the squamous bone and in the roof of the zygoma upward and forward over the external meatus. This type of cholesteatoma is met with only occasionally where the diploëtic bone is extensively invaded.

From the day of the operation the nausea and vomiting stopped. In spite of the extensive bone cavity resulting from the operation, the process of epidermizing proceeded rapidly. Six weeks after operation the radical cavity was quite dry. No evidence of the fistula could be obtained by compression and suction of air but there developed quite promptly the typical caloric response from blowing compressed air into the external meatus that is a rotatory nystagmus with the quick movement toward the opposite side. The functional tests of hearing two months after the operation demonstrated a marked improvement, rather unusual result after the radical operation. The whispered voice was easily heard at a distance of 3 feet better now than for the opposite ear. The explanation for the marked improvement was the subsidence of the condition of serous labyrinthitis which has been responsible for the profound depression previous to the operation.

The return of the hearing in this ear was especially gratifying for this made it possible to recommend the radical operation on the opposite side where an active cholesteatoma was present. Had the hearing not returned in the operated ear we should hesitate long before advising the radical mastoid on the ear on which the patient had to rely for her hearing. This is a principle too often overlooked by otologists, as is seen especially where the simultaneous radical operation on the two ears is recommended. Such procedure is in our judgment never

CLINIC OF DR. HERMAN L. KRETSCHMER

PRESBYTERIAN HOSPITAL

TRAUMATIC KIDNEY

Traumatic Kidney Discussed Particularly from the Standpoint of the Industrial Physician and Surgeon. Presentation of Cases Illustrating the Various Types of Traumatic Kidney

THIS morning I wish to discuss with you the subject of traumatism to the kidney. Our conception of injuries to the kidney has always been an injury that was severe in nature, as the result of which the kidney was very severely damaged.

As illustrative of this type of injury might be mentioned gunshot wounds, severe fractures, and injuries of a similar nature. In recent years there has come under my observation a series of cases that represent a different type of kidney injury. The injuries were all sustained by the patients during the pursuit of their usual occupations. Since the increase of manufacturing interests in this country there have been employed larger and larger bodies of men, and the work of some of these men has been of a more or less hazardous nature with the result that a large number of men employed are injured each year. For the protection of the workmen the various states have passed Workmen's Compensation Acts and as a result thereof there has necessarily arisen a desire on the part of the employing corporation through its industrial surgeons to more carefully study their cases of injury to the kidney. The importance of this phase of the subject is apparent to those of you who are engaged in the practice of industrial medicine and surgery. At times it may be difficult to fix the liability and at other times there is no liability at all.

For the purposes of discussion let us consider first, the cases that one sees remotely after the injury was received and second

there may be cases in which the bleeding does not come from the kidneys at all although there is a very definite history of kidney injury which might even be quite severe. As an example of this type and also illustrating the great care necessary in guessing permit me to cite the following case

Male aged thirty referred by Dr L. P. Kuhn While engaged in the performance of his usual occupation patient received a severe injury to the back. Following the injury patient immediately noticed blood in the urine and it was stated that the urine was port wine colored. A physician was called who made a diagnosis of hematuria and fracture of the last rib This case came before the industrial board, and the physician stated that the hematuria was renal in origin and that the kidney was injured by penetration of the end of the fractured rib which injury the patient sustained in carrying out his usual occupation. So convincing was his testimony that the patient was awarded a verdict of \$2800 as well as his hospital bill I was asked to see the patient. Cystoscopic examination revealed the presence of a papillary tumor near the right ureteral orifice The broken rib and injured kidney were supposed to be on the left side.

Comment is hardly necessary

2. Cases in Which Kidney Disease was Present Prior to the Injury as Evidenced by the Pathology—There can be no doubt I think that injury even mild in degree may be a very important factor in some cases of so-called traumatic kidney. If great care is taken in eliciting the history it will be found that the patient is quite sure the symptoms began shortly after he received his injury and I believe the patient is perfectly honest in his statement. *As my cases of this type have come under observation in which the urinary symptoms were either very much aggravated by an injury or cases in which the patient's attention was first called to the presence of urinary tract disease by an aggravation of symptoms symptoms that may have been so mild that they were not noticed.* And yet there is no doubt in my mind that the pathology as found was such as to lead one to believe that the pathology in the case was not the result of trauma. As examples I would like to briefly mention 2 cases

the cases of injury of the kidney that one sees immediately at the time of injury.

Trauma of the kidney aside from the history of injury generally has as one of its cardinal symptoms the presence of blood in the urine. A history of injury no matter how slight, and the presence of blood in the urine would seem to be *prima facie* evidence of direct kidney damage and if this is the result of a trauma incurred during the occupation of the patient, it would upon this rather superficial data place the liability for damages directly upon the employers or employing corporation. Especially important is this as bearing upon the Workmen's Compensation Act. You who engage in this special field of practice are more familiar than I am with its workings.

The two fundamentals to be worked out in each case are

1. Was there blood in the urine following injury?
2. Was the hematuria due to the injury or are there other pathologic lesions present that may account for the hematuria.

In industrial work the same as in private practice the statement is often made that the patient had hematuria. One may be obliged to accept this as a fact because one cannot dispute this statement, and sometimes it becomes necessary to accept the statement of the doctor who saw the patient after the injury or alleged injury was received.

It becomes necessary therefore in each and every case in which there is a history of trauma either of severe degree or mild in its nature to consider the possible rôle of the trauma in the production of the symptoms as well as to consider the possibility of the existence of previous disease of the kidney which has been fanned into activity by the trauma. Or one must consider the possible previous existence of a pathologic condition in the kidney and that the patient's attention to his urinary tract has been called into existence by the trauma.

Before entering into a more detailed discussion of the subject it may be advisable to illustrate some of these remarks with case reports which I will present very briefly. For purposes of discussion I will attempt to group the cases.

1. Extrarenal Source of Bleeding. It is self-evident that

many of the cases that were reported in the older literature as cases of traumatic kidney due to muscular strain were in reality cases that had some organic lesion as a basis for the hematuria.

3 Cases in Which Kidney Lesions are Found that May Not Be the Direct Results of the Injury —The problem of fixing the degree to which the trauma is a factor in producing the disability of the patient is quite difficult in cases in which lesions of an infectious nature are found such as a mild chronic pyelitis. In a given case in which the patient states that he was absolutely free of urinary symptoms prior to the injury and that subsequent thereto he has had persistent pain in the back, and in which careful urologic study shows a mild chronic pyelitis, the determination of liability becomes a difficult problem. Especially so if immediately after a mild trauma there occurs an alleged hematuria of a few days duration. We are then confronted with the question of whether the trauma really produced the hematuria or whether the hematuria is the result of the pyelitis and to what extent if any did the trauma serve to the extent of being a factor in the production of the pyelitis. As an example of this type let me read you the following history

J C B Benton, Ill. referred by Dr Geo G Davis.

In July 1920 patient slipped while pushing a cart and felt a pain across the left side of chest. Since then he has felt a pain when lifting. January 10 1921 a truck fell on him. Did not stop work but injury caused considerable discomfort. Nine days later while lifting and pushing a car off the slide rail he felt a stinging sensation under the margin of the ribs. Following this he noticed a lump to the right of the right rectus muscle, which he pushed back.

Patient was admitted to the hospital complaining of pain on right side of abdomen and back, frequency and pain on urination loss of weight and strength and shortness of breath.

Pain on right side of abdomen and back began after injury in July. Was unable to work for three weeks because of pain in right abdomen. No hematuria was noticed. Soreness has persisted up to present time but has been able to work. On January 21st was hit in abdomen by a piece of timber but was

A. L., aged forty-four postal collector. Fifteen years ago patient while driving a mail wagon received a severe jolt and felt a sudden tear in left loin with swelling soon after. Two operations for perinephritic abscess were performed. After second operation he tore open the incision while running and this sinus has remained open ever since. Patient entered Hospital because of a sinus in left side. Left nephrectomy was performed and stone found in kidney.

L. R., aged twenty-seven, electrician was referred by Dr J B Moore Benton, III. One month before coming under observation patient strained his back while lifting an armature. At that time he noticed a sharp pain in the back. Blood was first noticed in the urine two days later and persisted up to time of entrance to hospital. No blood was ever noticed prior to injury. Examination of abdomen was negative. No tumors or masses. x Rays were negative with the exception of a small wheat-sized dense shadow in region of left kidney. Cystoscopy showed a few areas of ulceration in bladder wall. Ureteral orifices were normal and ureters catheterized without difficulty. Urine from the left side was turbid from right side clear. Cell count and cultures were as follows:

	Cells	Cultures
Bladder	3800	Sterile
Right kidney	6080	Bacillus coli
Left kidney	340	Sterile

A second cystoscopic examination was made one month later. There was no flow of urine from the right side. Very turbid urine from the left side, which showed 3200 pus-cells and sterile cultures. Urine from the left kidney was stained for tubercle bacilli and found positive +++ Ginea-plugs were injected and were negative for tubercle bacilli.

These are cases that might very easily be classified as injuries due to muscular violence and yet this in the face of the findings is impossible.

One is impressed with the off-hand way in which the older men reported cases of this kind purely on the history and without any careful urologic study. It has often occurred to me that

physician tells his patient that as the result of his injury he has developed stone. This error is generally due to the wrong interpretation of shadows that are now universally recognized as being of extra-ureteral origin. In this group of cases our problem is simple. All that is necessary is to prove that the shadow or shadows are of extra-ureteral origin by passing a shadowgraph catheter. Several cases of this nature could be cited, but I hardly feel that this is necessary.

This group of cases has been cited to illustrate some of the problems and some of the difficulties of diagnosis and in the fixing of liability in cases that have come under my observation within the past few years.

Injuries of the kidney are usually divided into two groups depending on the presence or absence of an external wound. Injuries without any external wound are usually designated by the term *subperietal*. The extent of damage to a kidney is in part directly due to the severity of the trauma, and in very severe injuries the kidney may be only a part of the general damage done; the other organs may be injured at the same time—liver, spleen, genito-urinary tract, etc., including peritoneal tears. This has led to the use of such terms as *complicated* and *uncomplicated* kidney injuries, the term *uncomplicated* being reserved for cases in which only the kidney, its blood-supply and the pelvis and ureter are injured.

Depending also upon the extent of the injury, further division into *incomplete* and *complete* rupture is possible. Cases in which the laceration does not extend beyond the fibrous capsule and in which the entire thickness of the kidney is not involved have been designated as *incomplete*. *Complete* rupture includes cases in which the fibrous capsule has been torn and in which the entire thickness of the kidney has been lacerated.

Pathology—In mild cases there may be tears of the fatty capsule without injury to the kidney parenchyma. This generally results in the collection of blood in the perirenal tissue. The end result generally is absorption of the blood or it may become encysted. Rarely does infection of the blood occur and

able to work. On January 29th he was pushing a car and again tore something loose which was followed by severe pain which radiated down into the scrotum and was dull and aching in character. This pain has never let up except for short intervals. Has not worked since that time. Keeps him awake at night. Frequency and pain on urination started immediately after the last injury. The pain lasted only a few days, but he is obliged still to void frequently in the daytime and occasionally once at night. Lost about 30 pounds after last injury.

Examination of the abdomen showed tenderness under the costal margin on right side. No tumors or rigidity. No definite tenderness to fist percussion in costovertebral angles. Left kidney not palpable. Right kidney questionably palpable.

Cystoscopy June 30, 1921 showed bladder and ureteral orifices normal. Left ureter catheterized easily. Three catheters were used in the attempt to enter the right kidney pelvis. Finally a small catheter passed. Ureteral catheterization showed the following:

	Cells	Cultures
Bladder	0	Sterile
Right kidney	180	Sterile
Left kidney	90	Sterile

Pyelogram of both kidneys was made. Kidney outlines were apparently normal.

Phenolsulphonephthalein test showed an output of 22 per cent. in one hour.

A second examination of the bladder urine showed 30 pus-cells and a culture of *Bacillus coli*.

4 Cases in Which a Question of Liability Arises Due to the Wrong Interpretation of Roentgenograms.—Since the routine use of x rays in cases of injury to the back many roentgenograms have been taken and the plates have not been read or interpreted correctly. In other words the physician has been led astray by the Roentgen ray or rather by his faulty interpretation of what was found in the plate.

For example patients are examined with x-rays and shadows are found in the plate which are interpreted as bones, and the

presence of blood in the urine, render the diagnosis relatively easy the diagnosis of trauma to the kidney being less difficult than it is to establish the degree of injury. To these may be added shock. Later anuria and uremia may be added to the clinical picture.

Absence of Hematuria.—Suppuration of the perirenal exudate may occur and this generally begins about the third day. This picture too may be clouded by the onset of some intercurrent disease for example typhoid.

To you who are engaged in industrial medicine and surgery this end of the problem is simple. The difficulty encountered is with the patient who has passed through this stage and then comes up for compensation. To illustrate these problems it was my object to present the case reports mentioned earlier in the hour.

Treatment.—The treatment of kidney injury is based upon the severity of the injury and falls into one of two groups—operative and non-operative.

Non-operative Treatment.—Since the milder forms of kidney injuries tend to recover spontaneously the patient should be given the benefit of expectant treatment. This should include rest in bed for at least five or six days. Especially should the patient be kept in bed when gross blood is present in the urine. At the end of this time the danger of complications are well over.

Shock should be treated in the usual way with morphia, external heat, and plenty of fluid, either intravenous subcutaneous or per rectum. Blood transfusion or the use of gum glucose may be indicated.

The value of ice-bags applied to the back is probably doubtful. Immobilization by adhesive tape may aid in making the patient more comfortable.

Cases in which one believes that both kidneys are the seat of injury had best be treated expectantly.

I cannot subscribe to the view held by many that each injured kidney must be operated on at once. I have always felt conservative about the management of these cases, and I have

if it does suppurate with the formation of a perinephritic abscess results.

Contusions of the renal parenchyma without laceration of the capsule are generally associated with slight hemorrhage which may be subcapsular or which may occur as hemorrhage into the parenchyma of the kidney and extend from the cortex to the pelvis. These irregular areas of hemorrhage when absorbed result in the formation of scars.

When the capsule is torn and the laceration extends into the calyces of pelvis, true rupture of the kidney exists. The laceration or fissure is supposed to occur most frequently on the anterior surface and is generally transverse in direction, although the tear may radiate from the hilus. As a result of the laceration there occurs leakage of blood or blood and urine into the surrounding tissue, depending upon whether the pelvis or ureter are torn or not. In severe lacerations the kidney may be divided into two halves which may be held together by the pedicle or the entire kidney may be divided into many small fragments.

The extravasation of blood and urine usually collects in the retroperitoneal cellular tissue sometimes forming a rapidly growing fluctuating tumor. This perirenal extravasation may burrow downward toward the iliac fossae. Occasionally the fluid may pass through the inguinal or femoral canals and collect in the scrotum or thigh. Occasionally the fluid may burrow along the ureter or collect in the pelvis. The extravasation fluid may go on to absorption. It usually becomes infected and must be evacuated and drained. Complete detachment of the kidney is rare and practically always fatal.

Rupture of the Peritoneum.—This occurs rarely in cases in which the kidney only is injured and as previously mentioned belongs to the group usually spoken of as complicated injuries.

The peritoneal tear permits the extravasated blood and urine to find their way into the peritoneal cavity with the result that peritonitis rises.

Symptoms.—The history of a recent injury, the evidence of injury to the kidney as seen upon inspection coupled with the

CLINIC OF DR. GATEWOOD

PRESBYTERIAN HOSPITAL

SARCOMA OF THE TWELFTH RIB

Girl Aged Fourteen Presenting Symptoms Referable to a Tuberculosis of the Spine. Differential Diagnosis. Exploratory Operation Reveals Tumor of the Twelfth Rib—Microscopically a Sarcoma. Radium Treatment. Report of 2 Cases with Similar Findings, One an Osteochondroma and the Other a Metastatic Carcinoma of the Rib

THIS rather slender girl whom you see before you is fourteen years old. She was brought to me a few days ago by a very good general practitioner who had made the probable diagnosis of tuberculosis of the spine. The following history was obtained from the girl and her mother

The patient has always been more or less ill since she was four years old having had frequent infections of the nose pharynx and more recently the ear. Aside from the usual childhood diseases such as measles and chicken-pox, she has had no serious illnesses until she developed this media three years ago. Following this her tonsils and adenoids were removed and she has been somewhat better. She has done very well in her school work and in spite of her illness is as far advanced as the average girl of her age.

The present trouble began about a year ago when she first noticed occasional pain in the left side of her back. This pain would at times radiate downward into the lumbar region, though it frequently was little more than a dull ache. For the last month she has complained of a sharp shooting pain under the costal margin. This was not associated with respiration or aggravated by deep breaths. About this time her mother dis-

never yet had occasion to regret my conservative stand in handling these cases.

The presence of retention of urine due to clots calls for appropriate treatment. When there has been enough bleeding to cause clots and retention I believe the patient should be kept in bed for at least two weeks.

Operative Treatment.—Uncomplicated Cases.—The surgical interference is either immediate or remote. The indication for immediate intervention is hemorrhage. This may be so severe at the start as to justify or demand immediate operation, and one is guided in his decision by the increasing pallor of the patient, the thready running pulse sighing respiration, and a gradual progressive increase in size in the tumor in the kidney area. On the other hand the bleeding may not be very great at the start but it may continue for a long time, or there may be recurring attacks of hematuria which demand surgical intervention for their control.

The indication for late operation besides late secondary hemorrhage are suppuration in the perirenal space infection of the kidney and hydronephrosis.

Complicated Cases.—In the complicated cases with intra peritoneal injury exploratory laparotomy is indicated. At times it may be difficult to determine just the amount of intraperitoneal injury.

The kidney operation at the onset is usually exploratory in nature. Often it is only necessary to remove the clots and establish drainage. Hemorrhage may be controlled by tamponade. The tears in the kidney as well as injuries of the pelvis can be repaired by suture.

Where the damage to the kidney is severe a thing short of nephrectomy is indicated.

CLINIC OF DR. GATEWOOD

PRESBYTERIAN HOSPITAL

SARCOMA OF THE TWELFTH RIB

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covered a curvature of the spine. She also found that there was some swelling in the region of the left costovertebral angle, which was quite tender. There has been some loss of weight, the patient weighing 87 pounds a year ago and only 82 pounds

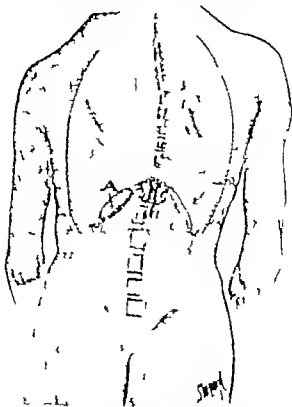


Fig. 304 —Note lateral curvature and swelling in costovertebral region suggesting cold abscess

at present. The mother thinks the loss of weight has occurred within the last three months. Except for a poor appetite there is little else of note in the history. She has no cough or shortness of breath.

On physical examination one finds, as you may see a some-

what undernourished pale girl rather tall for her age. She has a deflection of the septum which makes nose breathing somewhat difficult. There is a perforation of the right ear drum. The chest is asymmetric, there being some bulging in the left costovertebral angle and a slight curvature of the spine with the convexity to the right. The spine is not very rigid, although not as mobile as one would expect in a girl of this type. There is very marked tenderness in the region of the swelling. This swelling seems to be firm although careful palpation is difficult on account of the tenderness. Examination of the chest reveals no evidence of tuberculosis.

Leukocyte count is 9800 and hemoglobin 65 per cent. (Dare)

There are a number of things to be considered in making the diagnosis. In the first place probably the most common condition is what her home physician has suspected that is, tuberculosis of the spine in the dorsal region with a cold abscess. The location the loss of weight the anemic condition of the patient, the pain in the back and the deformity all suggest this condition. However on going over her spine carefully I am unable to find any localized point of tenderness over the vertebrae. Furthermore there is not the rigidity one would expect for a tuberculosis of the spine with an abscess at this point.

The next most likely condition probably would be a tuberculous process in the rib. This condition is much more common than an acute osteomyelitis. Tuberculosis of the rib may be primary but it is usually secondary to tuberculous pleurisy or pulmonary tuberculosis, but our x ray findings will effectually rule this out.

In regard to acute osteomyelitis one must be a little cautious in excluding it. It is of very rare occurrence. Fantozzi¹ in 1920 was able to collect 51 cases from all the literature excluding naturally the secondary infections following empyema and drainage. In many of the cases which he reported there was a swelling very similar to the condition present here. The presence of osteomyelitic foci elsewhere will of course help one greatly in making a diagnosis. She has had a great deal of trouble with

¹Fantozzi Policlinico, 27 1920, p. 408

her tonsils and a suppurating ear either of which might act as a focus, but there is no evidence of other secondary involvement. In four-fifths of Fantozzi's cases but one rib was involved, the seventh being most frequently affected. None of his cases perforated into the pleural cavity. While he includes empyema (necessitatus) and pararenal abscess in his differential diagnosis, they can be readily excluded here, even without the aid of the x-ray.

The third condition which one must consider is a neoplasm. Neoplasms of the rib are also rather uncommon. Hedblom was able to collect 213 cases of tumor of the bony chest wall. These included tumors of the sternum and clavicle as well as those of the ribs. Of this number 131 were sarcomas, 40 chondromas, and 24 metastatic carcinomas. The others were fibromas, exostoses and gummas. By far the greatest number were sarcomas.

We will now see what we can make out of our x-ray pictures. First we note there is no evidence of pathology in the vertebrae. Here we find a tumor of the twelfth rib which is a fusiform swelling apparently not breaking through the periosteum at any point. It is consistent with being a cyst. It might possibly be an inflammatory condition, although this is quite unlikely as there is neither evidence of sequestrum nor involucrum formation. It may be a chondroma or sarcoma. The fact that it has not broken through the periosteum speaks against sarcoma and in favor of one of the more benign tumors although central sarcoma may persist for considerable time before breaking through. It is not multilocular as one would expect to find in a bone-cyst. Under the circumstances I feel that the most likely diagnosis is chondroma, especially since it developed so near the end of the rib.

Under ether anesthesia I am making an incision about 15 cm. long parallel to the course of the twelfth rib. Upon exposing the rib there is no evidence of involvement of the soft tissues about it. Most of the tumor mass which one felt from the outside is due to the asymmetry of the chest wall and

little to the tumor itself. I am being particularly careful in my dissection not to open the pleura. This accident probably



Fig. 303.—Osteosarcoma of the twelfth rib developing in the medullary cavity. Notice the tendency multilocular arrangement which led to the possible diagnosis of bone cyst. Note the lateral curvature of the spine which had been mistaken for evidence of tuberculosis. (This picture is reversed.)

would not be very serious although it has been pretty definitely shown that shock occurs more frequently in cases in which the

pleura has been opened than in those in which the tumor is removed extrapleurally. On the other hand a great many cases of shock and some cases of death have been reported following removal of tumors of the chest wall even though the pleura was not opened at any time. In case we should accidentally tear through the pleura, I shall attempt to make an immediate closure. As you see, I have had our anesthetist Dr. Herb have the intrapharyngeal insufflation outfit in readiness, as this is a rather important aid in the event the pleura is opened. It is very difficult to free the rib at the vertebral angle and as I now have it entirely free elsewhere I am going to twist it out. This is accomplished without opening the pleura though we can see the lung move directly beneath it almost as clearly as though you were looking through a pane of kinglyass. I have some radium in readiness to insert here in the event the tumor appears to be malignant. Under the *circumstances* I feel that immediate complete closure is justifiable and am making the same. The patient shows no shock and has stood the operation very well.

Upon section of this tumor I am rather surprised to find that it is not a chondroma, but has the appearance of a sarcoma, but I shall depend upon microscopic section before reopening the wound. The tumor is granular. There is not the homogeneous opalescence of cartilage anywhere in the cut section (Fig 306 A).

Of the other tumors of the chest wall which were not to be considered in this present case carcinomas are by far the most frequent. I have here a section of a rib removed postmortem from a patient on whom I operated some months ago and removed a gland for diagnosis. This patient from some unknown cause had been losing weight rather rapidly. Finally some small glands were found in the right inguinal region, and I removed one of these for diagnosis. Rather to my surprise sections showed definite adenocarcinoma and I hazarded the guess that the tumor was primary in the prostate although the patient had absolutely no prostatic symptoms. Shortly after ward he developed pain in his chest and collapse of the lung

The x ray showed what you can see here that is, definite metastases. One other tumor might be considered even in this particular case that is a metastatic hypernephroma. Hyper

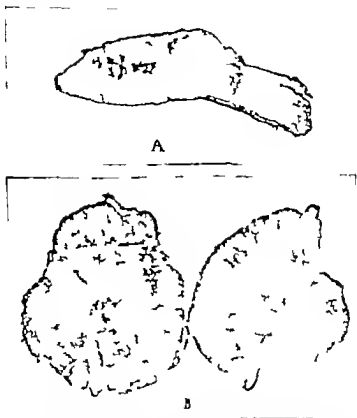


Fig 306—A Photograph of longitudinal section of osteosarcoma removed at operation from case herewith reported. B Osteochondroma removed by Dr Phemister from girl twenty-two years old. Contrast the homogeneous cartilaginous areas with the granular surface of A

nephromas occur in young people and are very prone to bone metastases. While the ribs are not frequently involved still a number of cases have been reported.

I want to show you along with this case a specimen which

was removed by Dr. Phenister a little while ago from the chest of a girl about twenty. This tumor is unquestionably an osteochondroma and you can see a very evident difference between the two tumors. It is homogeneous in structure somewhat opalescent and has attained this large size without any general symptoms (Fig. 306 B).

Tumors of the chest wall occur in the majority of instances in the anterior portion, only 15 per cent. being found posteriorly. The treatment is usually extirpation, and where the tumor is primary some few radical cures have been obtained. Of course metastatic carcinomas are not suitable for extensive operation,

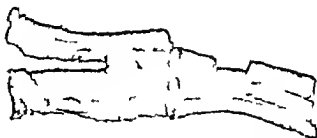


Fig. 30 —Osteoplastic carcinoma of the ribs showing multiple metastases from small primary carcinoma of the prostate

and frequently sarcomas have invaded the soft parts to such degree that radical removal is out of the question.

I might cite however, the case of recurrent carcinoma of the breast operated upon originally September 17, 1917. In August, 1920, the patient returned with a nodule in her old scar about 3.5 cm. in diameter and firmly fixed to the sixth rib. As there was no evidence of mediastinal involvement and there seemed to be good skin enough to cover an operative defect, I undertook to remove it. By wide dissection I took out about 4 cm. of the rib with a block of the overlying tissue and obtained primary closure. This was followed by irradiation and over a year later she had no evidence of recurrence, demonstrating to me

that occasionally operative interference is worth while in apparently hopeless recurrences of the chest wall

Chondromas frequently recur and they seem to be predisposed to malignant degeneration, so that some of these tumors—and perhaps the one we have removed this morning belongs to this class—are chondrosarcomas. Hedbloom reports a case which was operated upon at the age of six again at twenty-seven at thirty-six and finally at thirty-seven. The last time he had a definite sarcoma and died at thirty-eight of metastases

Postoperative Course—The microscopic sections showed that this was definitely a sarcoma with a great many spindle cells and some giant-cells in it. It is not ordinarily a benign tumor and therefore the prognosis is not very good. Since the sections were out I have reopened the wound under gas and inserted 50 mg of radium for twenty four hours. This delayed healing only a few days and primary union was obtained. The patient has gained considerable weight and her general health is very much improved

CLINIC OF DR. ROBERT H. HERBST

PRESBYTERIAN HOSPITAL

HYPERTROPHY AND CARCINOMA OF THE PROSTATE GLAND

A Case of Middle Lobe Hypertrophy with Beginning Carcinoma in Posterior Segment. Two-stage Prostatectomy Radium and x Ray Treatment. Pathologic Report. Future Plan of Treatment.

History — Present — The patient, a man seventy-seven years old, consulted us because of his increasing urinary disturbance. He complained of difficulty in starting urination with slowness of the stream, pain and frequency and pain in the right leg following the course of the sciatic nerve.

His urinary symptoms began about ten years ago but caused him no marked discomfort until about two years ago. Since then his symptoms have been progressive until at the time he consulted us he had marked dysuria and his frequency was so severe that he was obliged to urinate every hour day and night. The pain in his right leg had also become very troublesome.

Past — His past history is rather uneventful. He has had no operations and all his illnesses have been of minor importance.

His parents, brothers and sisters all lived to advanced ages.

Physical Examination. — The patient is a well-developed man weighing about 190 pounds and very well preserved. The physical findings are negative except for a perforation of the drum membrane of the left ear and a systolic heart murmur at the apex. The reflexes are normal.

Rectal Examination. — The prostate is enlarged one plus. There are small palpable nodules in both lobes. These nodules are felt more distinctly by palpating the gland with an instrument in the urethra. The consistency is firmer than normal, but not of unusual hardness. The prostate is not very tender.

Cystoscopic Examination.—It was not possible to pass a cystoscope into the bladder on account of the obstruction at the bladder neck. The residual urine measured 8 ounces.

Laboratory Findings.—The urine was quite cloudy from pus, negative for albumin and sugar and contained a few hyaline casts.

Blood—Hemoglobin, 90 per cent. white blood-cells, 8500. Blood-pressure systolic 182, diastolic 84.

Blood Chemistry—Blood sugar 125 blood urea 31 blood uric acid, 5.6 blood creatinin, 1.7 blood non-protein nitrogen, 35

X Ray report showed no abnormalities in urinary tract and films made of the osseous system did not show any bone changes indicative of metastases.

The character of the prostatic enlargement while not revealing the marked board-like hardness and fixity of a well-developed carcinoma still gave the impression of being malignant on account of the rather firm consistency the nodules, and lack of symmetry. Owing to the rather large amount of residual urine and infected character of same it was thought advisable to do a two-stage operation.

Preliminary Cystotomy—Seventeen days ago we performed a suprapubic cystotomy and found the bladder side of the prostate rather smooth and soft with papillary process projecting from the lower part of the internal urethral orifice, partially obstructing the urinary outlet. This was a typical middle-lobe hypertrophy. Bearing in mind the rectal findings, it seemed likely that we had a malignancy involving the lower posterior segment of the prostate with an associated benign hypertrophy of the middle lobe (Fig. 306). In the vertex of the bladder a diverticulum was found the opening of which admitted the index finger.

A large rubber drainage tube was placed in the bladder and the wound sutured. After three days this tube was removed and replaced by a dePease catheter. Following the cystotomy there was no shock or disturbance of pulse and temperature but incessant complaining of sleeplessness made it necessary to administer hypnotics for over a week following the operation.

After draining the bladder for over two weeks the patient is now in good condition for the second stage.

Second-stage Operation.—We will enlarge the fistulous opening into the bladder and with the aid of an assistant's finger in the rectum I will enucleate the enlarged middle lobe. Laterally this is easily accomplished, but posteriorly it is more adherent, however I have succeeded in separating it from the posterior segment of the gland leaving a rather rough surface at this point.

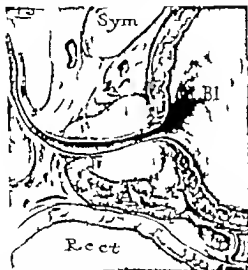
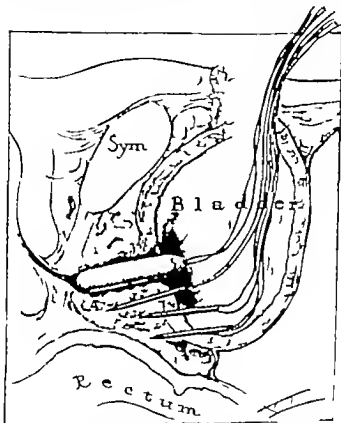


Fig. 308.—Cross-section showing location of carcinoma in the lower posterior segment of the prostate gland, associated with benign hypertrophy of the middle lobe.

I am quite convinced now that we have to deal with a malignancy in the lower posterior segment of the gland so I will insert this capsule which contains 50 mg of radium. It fits snugly in the space left by the removal of the middle lobe (Fig. 309). I will insert two needles each containing $12\frac{1}{2}$ mg of radium into the posterior part of the gland so that they are about 1 cm apart and about the same distance from the radium capsule giving an opportunity for cross-firing. I will pack some iodoform

gauze against the capsule and needles. Insert a rubber drainage tube and close the wound in the usual manner. The capsule



Traction on these cords furnishes the means for removing the radium from the bladder. The capsule of radium is screened with 1.4 mm. of gold and covered with a rubber sheath. The needles are screened with 0.3 mm. of platinum and have no other cover.

The capsule and needles containing radium were not removed for twenty-four hours, as there had been no unfavorable reaction necessitating their removal earlier. This exposure gives us a total dosage of 1800 mg. hours.

Pathologic Report.—Microscopic examination of the removed gland showed in the upper part a normal arrangement of alveoli and stroma. At the lower edge there were a few areas showing an abnormal proliferation of atypical epithelial cells, and another area in which the alveolar cells had broken through the basement membrane. There was also some perivascular round-cell infiltration and an increase in fibrous tissue.

The specimen definitely shows the carcinomatous process beginning in the lower segment of the gland and encroaching on the upper or adenomatous portion thus verifying our preoperative diagnosis.

Subsequent History.—The postoperative course was uneventful. Four weeks after the prostatectomy 30 mg. of radium at the end of a urethral staff was placed in the prostatic urethra and was kept in place for eight and a half hours making 425 mg. hours. This radium was screened with 1.4 mm. of gold covered by a rubber sheath.

The patient will be subjected to a course of deep cross-firing ray treatments.

Postscript.—The prostate gland is richly supplied with lymphatics which carry the cancer cells to the lymph-nodes in the regions of the ilia vessels and subsequently into the prevertebral glands.

Bone metastases are very common and secondary tumors of the spinal cord are sometimes found. Therefore all cases of cancer of the prostate should be subjected to a careful roentgenologic and neurologic study before any form of treatment is instituted. In a large percentage of cases the tumor begins in the posterior lobe of the gland and spreads upward behind the neck of the

bladder and trigone invading the intervesicular area and the regions of the seminal vesicles. For this reason it should be our object to imbed the radium into this area first if we may hope to prevent the spread of the disease. This is best accomplished through the opened bladder.

Benign hypertrophy of the middle or superior segment of the gland is commonly associated with cancer of the posterior lobe.

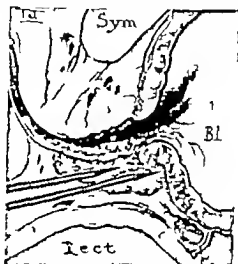


Fig. 310.—Cross-section showing long needles passed through perineum and embedded in malignant posterior lobe.

When this is found enucleation of the adenomatous lobe gives excellent opportunity for the application and imbedding of radium in the malignant part of the tumor as practised in this patient. Further irradiation of the lower part of the gland may be necessary but can be carried on by introducing long needles (Fig. 310) containing radium through the perineum.

TUMOR OF KIDNEY

Almost Complete Absence of Symptoms in this Case Diagnostic Methods. Nephrectomy Unusual Pathologic Findings.

History—This patient a male forty three years of age has had very few symptoms.

Eight months ago he had what he described as a cold. At that time he had a slight pain in the back and for four days had a painless hematuria. After this so-called cold subsided he felt quite well and returned to his work.

He has had no further symptoms and considers himself in good health. In applying for a new position as a paint chemist his prospective employers elicited the history of the hematuria and sent him to us for examination.

On being questioned he admits a slight feeling of pressure in his back and a slight loss of weight.

Three months ago he expelled a large tapeworm and has regained a little weight since then.

His past history is negative. He has been unusually free from disease all his life.

Physical Examination.—The patient is well developed and well nourished and appears to be in good health. The general examination is negative.

In the right side of his abdomen about 3 inches below the costal margin and 4 inches to the right of the median line there is a palpable tumor firm in consistency which extends to the margin of the lumbar muscles, and which moves with respiration. This corresponds in character and location to an enlarged right kidney.

Cystoscopic Examination.—Bladder showed no changes. Ureteral orifices were normal in appearance and were catheterized without difficulty. No urine could be obtained from the right kidney. A pyelogram of the right side was made.



Fig. 311.—Roentgenogram of postero-anterior view of kidneys. The kidney outlines are rather large, especially on the right side on which the kidney extends from the twelfth dorsal to the fourth lumbar vertebra. Right pyelogram shows marked deformity of the kidney pelvis, with dilatation of the ureter especially above the level of the fourth lumbar vertebra. This dilatation is due to pressure at this point by the enlarged kidney. The findings are compatible with kidney tumor. There are no stone shadows seen in any part of the urinary tract.

X Ray Report.—The kidney outlines are rather large especially on the right side on which the kidney extends from the twelfth dorsal to the fourth lumbar vertebra (Fig. 311).

Right pyelogram shows a marked deformity of the kidney pelvis with dilatation of the ureter especially above the level of the fourth lumbar vertebra. The findings are compatible with kidney tumor.

There are no stone shadows seen in any part of the urinary tract.

Laboratory Findings.—*Urinalysis*—The urine is clear free from albumin and sugar and has few hyaline and granular casts, and few white blood-cells in the centrifuged sediment. The urine was negative on culture also negative for *Bacillus tuberculosis* in direct smears and guinea-pig inoculation.

<i>Phthalein.</i>	First 60 min. reaction.	Second 60 min. reaction.	Second half hour
Left kidney	25-30 per cent.	15 per cent.	5-10 per cent.
Right kidney	No urine after one and a half hours.		

Blood—The hemoglobin is 85 per cent. Leukocytes 8800 per cm. Blood chemistry is within normal limits. Blood pressure is 138 systolic, and 84 diastolic.

A diagnosis of neoplasm of the right kidney was made and operation decided upon.

Operation.—The incision is made beginning at the costo-vertebral angle running obliquely forward and downward two fingerbreadths below the twelfth rib.

We expose the kidney and deliver it into the flank. The kidney is very large and shows a large tumor involving the lower pole the upper pole apparently is not involved. The ureter is freed for a distance of about 8 cm. clamped tied, and cut. The pedicle is very short and is clamped with difficulty after which we remove the kidney. The stump of the pedicle is ligated and the wound closed in the usual way. I noticed while palpating within the wound cavity that there were some enlarged pre vertebral lymph-nodes near the pedicle of the kidney.

Pathologic Report.—*Gross*—The kidney is 14 x 8 x 7 cm and weighs 425 gm. The external surface is glistening throughout and beneath the capsule there are several firm nodules ranging from mm. to 3 cm. in diameter. At the junction of the lower and middle third there is a depression running trans-

versely. At the junction of the kidney and pelvis there is a distinct line of cleavage that can readily be separated except at a few adherent points. On opening the kidney the cortex cuts with increased resistance but the substance resembles soft butter. There are places that coincide with the nodules mentioned on the external surface which are filled with a sanguineous cheesy substance.

Microscopic—The kidney cortex is markedly fibrotic, there is considerable round-cell infiltration. The tumor mass itself is made up of many large polyhedral cells many of which have undergone degeneration. The cells are irregular in size, some areas are definitely necrotic. Some of the cells resemble ganglion cells. The tumor is neither a carcinoma nor a hypernephroma.

The differential staining studies have not as yet been completed, so up to date it has not been possible to diagnose the tumor definitely.

Postoperative History—The convalescence was uneventful and the patient has gained weight, color and strength in the three months following the nephrectomy. He has been able to attend to his work without any difficulty.

On account of the malignant character of the tumor and the possibility of recurrence and metastases, we are giving him deep "cross-fire" x-ray treatments.

Remarks.—Three common symptoms of neoplasm of the kidney are pain, hematuria and tumor. It is striking to note that this patient never had any pain and but one short attack of hematuria. Nevertheless, this tumor was far advanced, having involved nearly the entire kidney and in many parts having undergone necrosis. This case illustrates the value of pyelography in the diagnosis of kidney lesions. This pyelogram not only demonstrated conclusively that the kidney was the organ involved but also that we had to deal with a neoplasm. The dilatation at the upper end of the ureter was caused by pressure of the enlarged kidney on the ureter at the level of the fourth lumbar vertebra.

CLINIC OF DR. FREDERICK G DYAS

COOK COUNTY HOSPITAL

CARBUNCLE OF THE NECK

Carbuncle of the Neck in a Patient with Long-standing Diabetes. Causes of Carbuncle. Operation and Result in Present Case. Treatment of Carbuncle in General.

This patient is fifty-seven years of age and comes to the hospital because of a carbuncle of the neck. Before going into the history it might not be amiss to run over some of the causes of carbuncle.

Carbuncle must be regarded as a localized area of gangrene. Gangrene may be divided into symptomatic, traumatic, infective thermal and electric. Symptomatic gangrene may be seen in thromboses embolism, Raynaud's disease ergot-poisoning diabetes senile arteriosclerosis and occasionally in syphilitic endarteritis.

Diabetic gangrene most commonly manifests itself in the region of the toes, in which the terminal phalanges are deprived of their blood-supply or in the form of carbuncle usually situated upon the back of the neck. It is probable that this location is favored by the paucity of its blood-supply and by the further fact that low-grade infections frequently gain entrance into the skin by abrasion from the irritation of a linen collar. In this location the blood-supply being naturally poor and the further fact that what blood does reach the area is impoverished in its nutritive qualities by the presence of sugar produces all the conditions necessary for the rapid growth of pathogenic organisms. Under these conditions there is a thrombosis of the vessels, exactly as is observed in acute infective gangrene. In that condition the gangrene is not caused by the trauma to the vessels

incident to the inoculation of the infective organisms, but to the rapid thrombosis of the blood caused by the quickly multiplying micro-organisms.

Infected wounds in diabetic patients always do poorly. Furthermore pulmonary tuberculosis is frequently observed in diabetic subjects as the result of poor nutrition of the apices of the lungs. These subjects often are robust, even obese in appearance and at first glance present the appearance of well-nourished individuals. However upon closer examination it is seen that they are overweight and that they are unable to do any great amount of physical work.

Among certain individuals diabetes is observed as a racial disease in others as a familial disease. In the present patient there is no familial or racial predisposition. On the other hand he is a well-nourished man, following an out-of-doors, healthy occupation.

Onset and Course.—H states that his trouble first began with a small pimple above one ear which has gradually spread around to the back of his neck. It has been very painful and has kept him awake a great deal.

Past History.—He had typhoid in childhood. There is no surgical history. The toes of the right foot were mashed three years ago. Venereal disease is denied.

Family History.—His father died at about seventy, his mother at ninety-two years. Two brothers are living and well, two sisters are dead, cause unknown.

He is married and his wife is living and well. There are 10 children living and well, 5 children died in infancy. H states that he has twin girls twenty years old who have six fingers and toes.

Habits.—He uses no alcohol or drugs, chews tobacco moderately. H sleeps well.

He has lost over 100 pounds in the last three years, yet he still seems well nourished.

Cardiorespiratory.—H coughs occasionally, has no dyspnea, edema, or chest pains.

Gastro-intestinal.—His appetite is good, he says he can eat

everything put before him. He complains of excessive thirst. The bowels are constipated but he has had no nausea vomiting or gastric pains.

Genito-urinary—There is frequency of urination—about every thirty minutes—and he passes a large quantity each time.

Physical examination reveals a well-developed adult white male lying in bed and apparently in some discomfort.

Essential Pathology—The essential pathology consists of a dark red swelling on the back of the neck about $3\frac{1}{2}$ by $2\frac{1}{2}$ inches, which is punctured with numerous holes which exude pus and also many small white spots which are due to pus just beneath the skin.

Head Scalp as described. The skull ears, and nose are negative.

Eyes The pupils are round regular equal, and react to light and accommodation.

Mouth The teeth are very dirty and there is much pyorrhea. The tongue and tonsils are reddened.

Neck The neck is negative except for the lesion described.

Chest The chest is well developed and symmetric, with fairly good and equal expansion. The lung resonance and breath sounds are good no rales are heard.

Heart The heart rate is somewhat rapid and all the tones are exceptionally loud and distinct. There are no abnormal sounds or murmurs.

Abdomen The abdominal walls are very soft and lax, showing many white lines from excessive stretching. There are no palpable tumors, no areas of tenderness or rigidity. The skin over the abdomen is very loose.

The genitalia are negative.

Extremities The skin is rather dry over the lower part of the legs and shows a tendency to scale. There is analgesia to pin pricks over the lower extremities below the knees. The knee-jerks are very weak but are equal on both sides. The Achilles reflex is not obtainable.

Diagnosis—A diagnosis of diabetes and carbuncle of the neck was made.

Operation.—A crucial incision was made and flaps dissected back. Necrotic material and skin were excised. Purulent material was curetted out. Iodin was swabbed over the entire wound. The wound was packed with iodoform gauze and hot dressings applied.

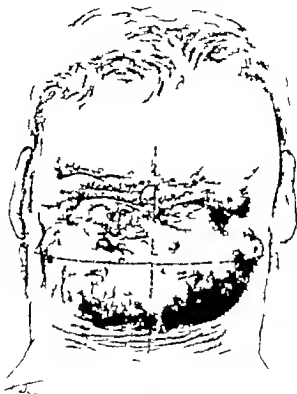


Fig. 312.—Drawing showing incisions employed in operation for carbuncle.

Postoperative Course.—The patient did not do well following operation. On the fifth day he sank into a comatose condition, accompanied by rapid respiration and pulse. Examination of

the chest though difficult because of the noisy respiration showed the presence of râles and soft tubular breathing could be heard. Moist râles appeared very prominent. A diagnosis of bronchopneumonia was made. He was given 1200 c.c. of 3 per cent. sodium bicarbonate in normal saline solution by hypodermoclysis and also 35 grams of sodium bicarbonate in 6 per cent. solution intravenously. His condition did not improve and he died later in the day.

In this patient the carbuncle was the result of the diabetes. The first requisite in the treatment of carbuncle due to diabetes is the reduction in blood-sugar. The amount of glucose which the urine may contain in diabetes is enormous. According to Wood, it may rise over 10 per cent. and the total excretion may approach 1500 grams in twenty-four hours. The amount of sugar varies with the time of day and the time that food is ingested. The minimum amount is found during the night hours during the day there are, as a rule two maxima, one about noon and the other toward 6 o'clock. These variations are dependent on the time of meals. In severe cases the sugar may be excreted continuously and even more abundantly at night. It is in the light cases that the greatest variations occur during the night the sugar may entirely disappear. The sugar sometimes alternates with the albumin which is often present in the urine of diabetes. One of the most powerful influences in producing fluctuations in the sugar content of the urine in diabetes is the condition of the nervous system. A sudden nervous shock will sometimes cause sugar to appear in the urine of a diabetic from which it has long been absent owing to careful regulation of the diet.

The treatment of diabetes is essentially medical. The treatment of carbuncle is both medical and surgical. While it is true that carbuncle is occasionally found in non-diabetic patients, diabetes should always be suspected until repeated examination of the blood and urine have shown the absence of sugar.

Iron should always be given in liberal doses to increase the general resistance of the patient.

It is useless to try to treat a carbuncle surgically without making incisions which extend out into healthy tissue permitting exposure of the whole carbuncle. This should then be cureted and all dead tissue removed. The raw surface is then swabbed with carbolic acid followed by alcohol and a large wet antiseptic dressing applied.

Healing occurs by granulation. In extensive cases skin-grafting is necessary.

CLINIC OF DR. J. RAWSON PENNINGTON

COLUMBUS HOSPITAL

HEMORRHOIDECTOMY BY THE "OPEN" METHOD

Technic of "Open" Method of Hemorrhoidectomy Advantages of this Method.

JOHN D. aged twenty two admitted March 16th to be operated on for hemorrhoids. Soon after admission he was given a laxative colonic flushing at 10 P. M. and an enema this morning.

As the patient lies in the lithotomy position, the first thing to which I wish to call your attention is the scrotal bandage (Fig. 313). This is a strip of gauze, 6 or 8 inches wide and 36 inches long, split from both ends to within about 2 inches of the center. You will notice it is tied about the thigh on each side holding the scrotum away from the field of operation. (I have this same bandage applied in the other sex as well while there is nothing to be kept out of the way. It affords some concealment which the patients appreciate.)

You will notice this patient is taking a general anesthetic because he preferred it. Practically all hemorrhoidal patients can be operated on under local anesthesia. If there are no contraindications I usually let the patient decide whether the anesthetic shall be general or local. The operative technic is exactly the same in either case.

After introducing the bivalve speculum the rectum is mopped out with soap and water then dried. I shall now stretch the rectum slightly. In such cases there is frequently more or less hypertrophy and constriction of the sphincter zone. This favors constipation and unrequited bowel movements. Judicious division of the sphincter is advisable in these cases as it aids in restoring the normal tone. Moreover I believe the

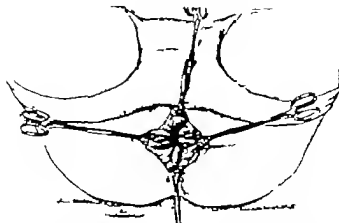


Fig. 313.—Illustrates the application of the acrotal bandage and the author's method of everting the terminal rectum, bringing the internal hemorrhoids into full view for operation. At the left is seen the result after removing the ellipse as shown in Fig. 314.

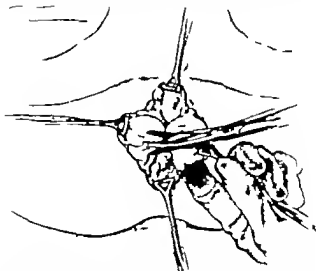


Fig. 314.—Shows one of the author's triangular forceps grasped by the left hand, the index finger making pressure on the skin side of the pedicle and the ellipse being removed from the skin which is curved on the flat.

patient has less pain after the operation by this plan and that the final result is better

I next apply a pair of my triangular forceps to each quadrant. Holding them in proper position (as you will notice) everts the field, and brings the pile tumors well into view (Fig 313) Notice that by grasping one of the forceps with the full hand and making pressure on the skin side that I force the mass more prominently into the field and with these scissors curved

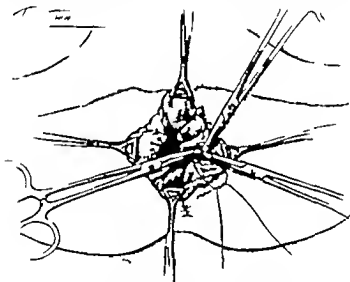


Fig 315 —Illustrates author' method of ligating the bleeding point or points. Note that the artery forceps are held flat against the patient.

on th flat, I remove an ellipse from the covering of each pile (Fig 314)

What do I do about the bleeding? The same that you do Doctor when you amputate a limb In this case I pick up the bleeding point with a pair of forceps Yes! I notice there is bleeding at that point, so we apply forceps there as well and here is another spot it might be well to include in the tie. You will notice I now take the three pairs of forceps in my hand and

place a ligature around all of them. The forceps after being divaricated are held by the assistants and as I tie the ligature you see it slips behind the forceps (Fig. 315) and we have a small knot of tissue ligated. In the course of two or three days this ligature will pass away. There! the ligation is done you see no evidence whatever of bleeding do you?

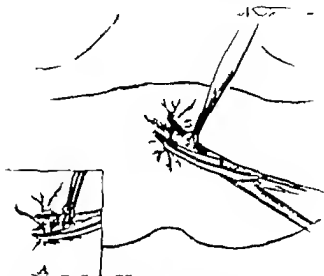


Fig. 316.—An ellipse of skin is being removed from an external hemorrhoid. Observe that as the external pole traction is made on the skin covering it, like in internal hemorrhoids (Fig. 314) the pole is pushed out the field. *A* shows the method of traction and forceps dissection of the hemorrhoidal mass after the skin flaps have been removed also incisions left for removal of the other masses.

The other hemorrhoids will now be removed in the same manner. Now that all of the internal hemorrhoids have been removed my triangular forceps are taken off and the field cleaned up preparatory to operating on the external hemorrhoid. Here practically the same technique I followed. You see we now remove a small ellipse over this hemorrhoidal mass and then dissect out the pile tumor (Fig. 316). Observe that now we have dis-

sected out the pile tumors the edges of the wound come together and you can scarcely notice the incision through which the removal has been effected (Each external hemorrhoid treated in same manner) The operation is now completed and were it not for the slight oozing through the incisions for removal of the external hemorrhoids you could scarcely see where I had operated on this man

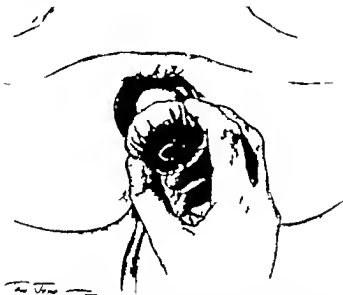


Fig. 317.—Introduction of the 'author' rubber-covered tampon through the bevalve speculum after the operation is completed

After a final cleansing of the field I introduce my rubber covered tampon, which holds the field of operation in a normal position, and will be removed at the end of eighteen to twenty four hours (Figs 317-318). Hot wet dressings or Dakin dressings are applied after removal of the tampon, and continued for the next two or three days, being renewed every three or four hours. Hot tub-baths or hot sits-baths are beneficial also. After two or

For method of making tampon, see Surg. Gyn., and Obst., October 1921 p. 430

three days or so of this after treatment patient will be allowed to return home.

After-history—March 18th It is now twenty-four hours since operation. Man is up wants to go home, says he "feels fine, and has no pain whatsoever. There is neither redness, swelling edema nor inflammation.

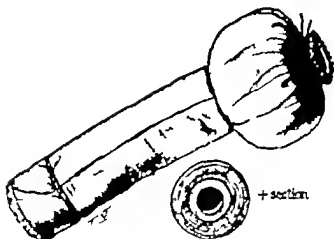


Fig. 318.—The tampon and cross-section. Approximate dimensions are Length, 4½ to 5 inches, diameter ¾ to 1 inch; length from bulbous enlargement to proximal end, 3 inches.

March 19th Patient bowels moved went to lavatory no pain.

March 20th Patient left hospital

Remarks.—I have operated on over 5000 patients by my open method and have not had more than half a dozen recurrences. I have seen postoperative contractures or strictures, no matter what method was used. Pain too follows all types of hemorrhoidal operations, but any surgeon of unbiased judgment knows there is more pain when thrusts are obstructed with a

ligature, burned, or sewed together than when none of these is done. Also that it is more difficult to find a bleeding point where hidden in a mass of tissue than when in an open field and that painful skin-tabs are more likely when the tissues are constrained than when not.

Some statistics from St. Mark's Hospital (London) are of interest in this connection. Anderson¹ during his service there as house surgeon made some observations on 300 operations—one half by the ligature method 100 by the Whitehead plan the balance by clamp and cautery. As regards pain, while pointing out a classification is difficult on account of the personal element, he makes a triple division. *Severe* needing over $\frac{1}{2}$ grain of morphin for relief *moderate* $\frac{1}{2}$ grain sufficient *slight* little or no opiate required.

	Severe	Moderate	Slight
Clamp and cautery	0 per cent.	30 per cent.	70 per cent.
Ligation.	10	57	33
Whitehead.	16	56	28

There were 8 instances of postoperative hemorrhage (a) Clamp and cautery 1 (b) Whitehead, 2 of secondary hemorrhage (c) patient interfering with dressing 1 recurrent hemorrhage 2 and secondary 2.

Since the paper by Anderson another series from the same hospital (but larger) has been analyzed by Gabriel² with especial reference to severe secondary hemorrhage. The findings were as follows.

Type and number	Number and days postoperative.
Ligation 408	Intermediate, 2 Secondary severe, 5 (7 7 7 7 8) Secondary slight, 6 (4, 5, 6, 7 7 8)
Clamp and cautery 18	Secondary slight, 1, (7)
Whitehead. 12	Intermediate 1

Intermediate hemorrhage (within twenty-four hours) according to Gabriel is caused by slipping of a ligature or persistent bleeding from some small vessel not tied at the time or in which

three days or so of this after treatment patient will be allowed to return home.

After-history—March 18th It is now twenty-four hours since operation. Man is up, wants to go home, says he "feels fine," and has no pain whatsoever. There is neither redness, swelling, edema, nor inflammation.

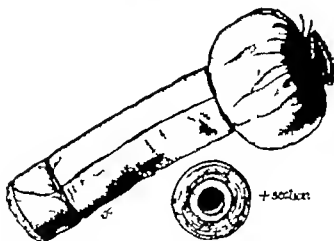


Fig. 315.—The tampon and cross-section. Approximate dimensions are: Length, 4½ to 5 inches; diameter ½ to 1 inch; length from balloon enlarged to proximal end, 3 inches.

March 19th Patient's bowels moved, went to lavatory, no pain.

March 20th Patient left hospital.

Remarks.—I have operated on over 5000 patients by my open method and have not had more than half a dozen recurrences. I have seen postoperatively strictures or constrictions, no matter what method was used. Pain, too, follows all types of hemorrhoidal operations, but any surgeon of unbiased judgment knows there is more pain when tissues are constricted with a

CLINIC OF DR. ALFRED A. STRAUSS

MICHAEL REESE HOSPITAL

THE SURGICAL TREATMENT OF CARCINOMA OF THE COLON WITH A NEW METHOD OF MAKING THE OPERATIVE FIELD EXTRAPERITONEAL BY MEANS OF THE OMENTUM

Two Patients Suffering with Carcinoma of the Colon in One the Tumor is Located in the Lower Sigmoid and Upper Rectum, and in the Other in the Lower Descending Colon and Upper Sigmoid. Operation Use of the Omentum to Make the Field Extraperitoneal. Presentation of a Third Patient Operated On Eight Years Previous Showing the Result Obtained by this Method.

This morning we have for operation 2 very interesting patients with carcinoma of the colon. In one the tumor is located in the lower sigmoid and upper rectum, and in the other in the lower descending colon and upper sigmoid. Before going into detail about these patients I would like to say a word in general regarding the surgical treatment and some of the principles involved in carcinoma of the colon.

Carcinoma of the colon is in many ways one of the most favorable conditions as compared with carcinoma elsewhere as far as being able to establish a radical cure or giving the patient a fairly large number of years to live before fatal metastases occur. This is due to two important clinical facts first, with our newer method of x ray and fluoroscopic examinations and the more complete routine x-ray examinations. They are discovered quite early and many times accidentally before many symptoms or very pronounced symptoms are present. For instance many times a patient complains of certain gastric symptoms that

the thrombus has become loosened from coughing, vomiting, or straining at micturition. In each instance there was considerable oozing during the first night, calling for change of outer dressings one or more times then active measures in morning. To avoid this the technic is most important. In the ligature operation especially care should be taken to keep the scissars accurately in the submucous plane to avoid dividing vessels unnecessarily. The distal portion of the ligated hemorrhoids may be left or if part is cut away an ample portion must be left to be sure no slipping of the ligature can occur.

Postoperative hemorrhage after twenty-four hours (if secondary) he states, is uncommon, and unless its possibility is kept in mind a large concealed hemorrhage may take place before being recognized. It is brought about by premature separation of the sloughing pile. After the ligature operation the ligatures come away as a rule between eight and twelve days. In this series the average date of bleeding was seven days postoperative. The chief factors are (1) infection (2) trauma (3) anemia and general debility to which may be added (4) rarely blood diseases, e. g. hemophilia.

All of which is further evidence. If any were needed, in favor of my open method of operation.

Anderson states the average stay in hospital was ten days for clamp and cautery twenty-one for ligature, and twenty-six for the Whitehead operation. Contrast this with the three or four days by my open method.

It has been my experience that recurrences are rather frequent following the closed methods (ligature clamp and cautery Whitehead) of operation and very rare following the open method. I should judge about 10 per cent. of the cases of hemorrhoid referred to me have been previously operated on (frequently two or three times) by one or other of the closed methods.

However in hemorrhoids as in other conditions, there is no short cut to relief untoward results are possible after any or all methods. What the profession should know is the one having the fewest objections and the greatest number of worthy points.

is that in bringing the bowel out one is not able to do as radical a removal of the carcinomatous area and adjacent colon, as well as the neighboring lymph vessels and glands and is really the only serious objection to the Mikulicz operation.

I believe the ideal surgical procedure is some method in which the cancer and its neighboring tissue can be thoroughly and completely removed and an end-to-end anastomosis made, which after all, seems to be the most physiologic type of anastomosis, the important factor being that it must be protected or made in such a way that the possibility of breaking down of the bowel along the suture line and leakage which would produce localized or general peritonitis is practically nil. I believe this can be accomplished by using the free edge of the attached omentum around the operated field of the colon in such a way as to make that portion of the colon extraperitoneal and have it thoroughly protected by the living omentum. This method will eliminate the possibility of leakage or peritonitis and also will prevent other loops of ileum or small intestine becoming adherent to the line of anastomosis. The latter not infrequently is a source of intestinal obstruction.

To prove that this is correct or that this principle of making the colon operation extraperitoneal is a practical and sound one one hardly ever deals with a peritoneal infection when a carcinoma is resected in the upper rectum or lower sigmoid by a sleeve operation in which the entire anastomosis is placed extraperitoneal below the peritoneum of the culdesac. I have never seen a peritoneal infection from the radical resections of the upper rectum or lower sigmoid when the anastomosis, no matter how poorly made, was placed below the peritoneum of the culdesac. This important principle of placing the operative portion of the colon extraperitoneal by means of the omentum has obviated this great difficulty and obstacle of leakage and peritonitis which is really the one factor that has held the surgery of the colon back from the proper position of perfectness that it should have.

The first case for operation is a man fifty-two years old who has a definite large mass which can be felt through the rectum

simulate duodenal or gastric ulcer only to find on complete fluoroscopic examination of the gastro-intestinal tract a beginning carcinoma of the colon or rectum. Second the growth, as a rule is comparatively slow. The majority of cancers of the colon are of the scirrhous type and therefore show metastases and involvement of the lymphatics comparatively late. From a standpoint of cancer in general, that of the colon is one of the most favorable types of cancer amenable to surgery and yet I do not hesitate to state that the surgery of the colon up to the present time is far from having been perfected to the satisfaction of the surgeon as far as end-results and operative procedures are concerned. There are many things wanting with regard to the technical difficulties and perfection of the surgery of the colon to make it safe as compared to the surgery of the small intestine. I believe this can be largely attributed to the fact that we have to deal with the colon bacilli in the large intestine and the stools contaminated with the colon bacilli as well as other organisms. The second important factor is the resulting or accompanying inflammatory process of the colon that seems to go along with carcinoma of the colon. For instance, if one would examine a resected colon for carcinoma grossly and microscopically one would find marked infiltration in the interstitial tissue between the muscle layers and the mucosa and a peculiar edematous swelling of the bowel in general. This infiltrated bowel plus the presence of the colon bacilli within its lumen is the great battle that we have to contend with in order to make the surgery of the colon just what we would like to have it, and for this very reason so many various techniques and methods have been devised, the ultimate object of all of them being to eliminate the breaking down of the bowel along the suture lines and preventing peritoneal infections and localized abscesses. I believe that of the earlier operations the three-stage Mikulicz operation was devised for that particular reason, to do away with the peritoneal infections and breaking down of the colon along its suture lines. It is one of the best and most practical operations today and with the average surgeon yields the best results of all the types of operations described. The objection to the Mikulicz operation

the anus. The purse-string of the everted bowel is cut and the bowel is left open. A catheter is attached to the sigmoid portion

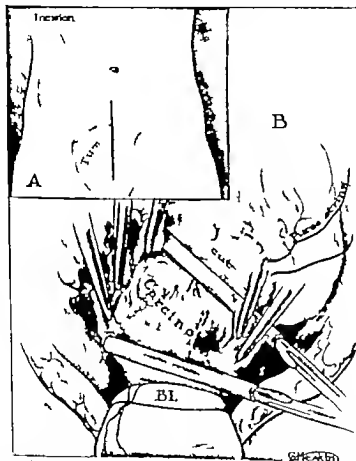


Fig 319-4 The base of incision, extending from the pubis to the umbilicus. B shows the intestinal clamps in position, one above and one below the carcinomatous mass. A purse-string suture is placed about 2 inches above the first clamp on the sigmoid side and a second purse-string suture is placed below the second clamp on the rectal side.

of the divided bowel (Fig 320) and the catheter is pulled through along the course of the rectum and through the everted bowel

and which is shown by the x ray and fluoroscopic examination to be a carcinoma of the lower sigmoid and upper rectum. To add to his difficulties he has had 2½ per cent. of sugar in his urine from which he is now free after medical treatment and also has an enlarged thyroid, which, however has no active toxic or exophthalmic symptoms. His symptoms have been peristaltic cramps and excruciating pain during bowel movements. His stools contain not a great deal of blood, but a fair amount of mucus and tissue shreds. He has lost about 15 pounds in weight, but his pulse and general appearance are not bad.

The patient is placed in an extreme Trendelenburg position and a midline incision is made from the pubis to the umbilicus (Fig 319). On opening the peritoneum a large circular carcinoma, which is freely movable, involving the upper rectum and lower sigmoid, about the size of a man's fist, can be seen in the hollow of the sacrum and as we examine the mesentery there seems to be no glandular involvement. The mesenteric blades on each side of the rectum and sigmoid are caught with clamps and divided and in this way the entire portion of the rectum clear down to the external sphincter is now freed by dull finger dissection without the slightest difficulty. There is practically no bleeding. The entire procedure so far is quite bloodless (Fig 319 B). Intestinal clamps are now placed one above and one below the carcinomatous mass, and a purse-string of silk is placed about 2 inches above the first clamp on the sigmoid side and a second purse-string of silk below the second clamp on the rectal side. The bowel is divided between the purse-strings and the clamps and cut away by means of an electric cautery. I will now free the sigmoid portion by dividing some of its mesenteric attachments and the outer blade of the parietal peritoneum so as to make it quite freely movable. The assistant stretches the sphincter of the rectum gently and a rubber catheter is passed up from below through the rectum to the point of the purse-string. I can now feel the catheter. I will put one ligature through bowel and catheter. The assistant now makes traction on the catheter (Fig 320) and the entire remaining portion of the rectum is easily everted out through the

the anus. The purse-string of the everted bowel is cut and the bowel is left open. A catheter is attached to the sigmoid portion

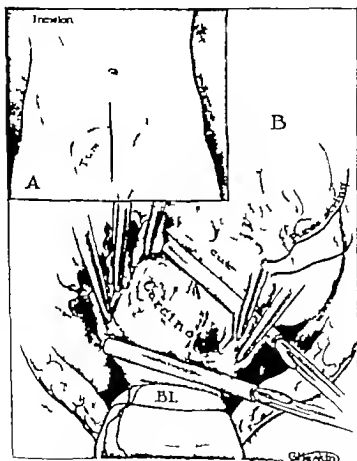


Fig. 319. A The line of incision, extending from the pubis to the umbilicus. B shows the intestinal clamps in position, one above and one below the carcinomatous mass. A purse-string suture is placed about 2 inches above the first clamp on the sigmoid side, and a second purse-string suture is placed below the second clamp on the rectal side.

of the divided bowel (Fig. 320) and the catheter is pulled through along the course of the rectum and through the everted bowel

(Fig. 321) The mesenteric vessels are ligated and sutured and the entire peritoneal surface is closed around the drawn through sigmoid. The abdomen is now closed in the usual manner. The everted rectum is amputated on a level with the anus and an end-to-end anastomosis with interrupted sutures is made with

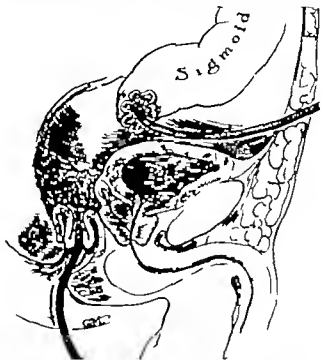


Fig. 320.—Drawing showing the rubber catheter in position. The catheter is passed up from below through the rectum, the point of the purse-string, and one ligature is placed through the bowel and catheter. Traction is made on the catheter and the entire remaining portion of the rectum is easily everted out through the anus.

the cut end of the sigmoid (Fig. 322 A). The bowel is then pushed upward and held in position with small amount of gauze. It will be noted from Fig. 322 B that the anastomosis is below the reflection of the peritoneum. In other words, the entire surgical procedure is extraperitoneal.

I have operated a number of these cases and find that within eight to ten days there will be a small amount of slough come away from the region of the anastomosis and in about three weeks you can feel in the rectum a perfectly well formed anastomosis. These patients have perfect stools, well formed with

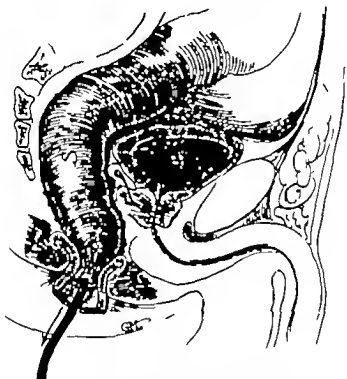


Fig. 321.—Showing how the catheter is pulled through along the course of the rectum and through the everted bowel.

out the slightest difficulty of sphincter control, and are more comfortable and more satisfied than with any other type of surgical procedure that I know of around the rectum and lower sigmoid. This type of operation is far more practical in the female than in the male, and many times cannot be carried out in the male with any degree of success.

The next case that I will operate is a woman forty-eight years old, who had the symptoms of an acute obstruction two and a half months ago and for which a temporary cecostomy was

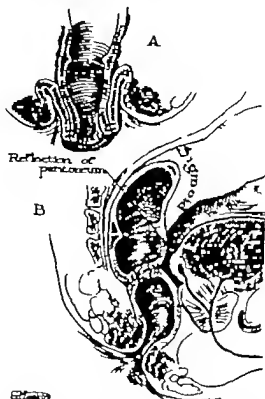


Fig. 322.—A The erected rectum has been incised on level with the anus, an end-to-end anastomosis with interrupted sutures is made with the cut end of the sigmoid. B Note that the anastomosis below is reflection of the peritoneum. In other words, the entire surgical procedure is extraperitoneal.

performed to relieve the obstruction. The carcinoma is located in the lower descending colon and upper sigmoid and is quite an extensive growth. It is interesting to show these 2 cases on account of the difference in location of the carcinoma. In these

2 cases two entirely different surgical procedures have to be performed and yet there is one underlying principle which will be carried out, that I believe is absolutely essential to the success of the surgery of the colon and which will render its mortality as low as possible by doing away with leakage and peritoneal infection. This principle is that all anastomoses and all surgical procedures of the colon should be made extraperitoneal as a final step. In the first case just operated, where the carcinoma was located in

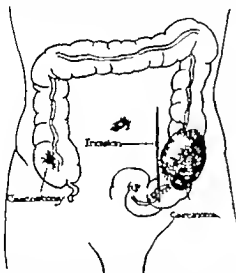


Fig. 123.—Diagram (Case 11) showing location of temporary cecostomy and the incision made at second operation for the removal of the carcinoma. The incision extends from several inches above the umbilicus down to the inguinal region.

the upper rectum and lower sigmoid I made a complete operation in one step by resecting the carcinoma and then doing a sleeve anastomosis which placed the anastomosed bowel extraperitoneal. While in the second case, where the carcinoma is in the descending colon and upper sigmoid I will do the second step of this operation by removal of the carcinoma, making an end-to-end anastomosis but rendering the operated portion of the colon extraperitoneal by means of the free edge of the living

omentum, believing *this last step* to be the most important and final step which renders the mortality almost nil. Then, finally some time later I will close the cecostomy as a third step in the operation.

I will now make a left rectus incision (Fig. 323) extending from several inches above the umbilicus down to the inguinal

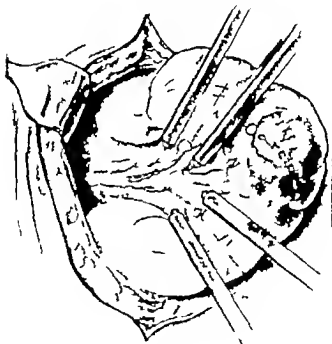


Fig. 324.—Showing isorectal clamps in position (Case II). One clamp is applied 3 inches above the tumor and the other 2 inches below. The bowel has been divided between the clamps by means of an electric cautery.

region. On opening the peritoneum one can very readily see a fairly freely movable mass in the upper sigmoid. On splitting the outer blade of the mesocolon the tumor can be lifted right out through the abdomen, and as you see is not quite as large

as the tumor in the first case. Two intestinal clamps are now applied 3 inches above the tumor and 2 inches below the tumor (Fig 324) and the bowel divided between the clamps by means of an electric cautery. The mesenteric vessels are caught by forceps and the entire mass is dissected away. The blood vessels in the mesocolon are ligated and an end-to-end anastomosis is made. The two ends of the bowel come together very easily for an end-to-end anastomosis especially by freeing the outer blade of the mesocolon. The first suture that I place is that nearest the mesentery (Fig 325 A) which is run through and through interrupted and is tied, and the other two are mattress sutures. Three more sutures one at each side and one above around the circumference are through-and-through sutures which are held but left untied. The next step is a simple over-and-over suture going through all the coats mucosa muscularis and peritoneum (Fig 325 B). This if properly placed, is as efficient as any type of suture for proper coaptation and union. Gastro-intestinal catgut is used. The interrupted sutures are now tied and a final Cushing suture of waxed silk (Fig 325 C) is placed around the bowel. I believe that this type of anastomosis, when properly performed, is as efficient as any type but there is always a tendency to leakage which we can easily avoid by the next step which I consider the most important of the entire procedure.

I will divide the great omentum between ligatures on the right side near the pyloric end of the stomach so as to allow the omentum to swing freely over the field of operation, as seen in Fig 326 A. If the carcinoma is on the right side in the ascending colon, then I divide the omentum on the left side at the body of the stomach so as to allow it to swing over to the right side. The great omentum is tucked over the entire area where the anastomosis has been made first along the parietal peritoneum and folded over the colon at its anastomosis where it is attached with a few interrupted catgut sutures, and swung back to the parietal peritoneum on the median side of the incision (Fig 326 B). Then the omentum is sutured around the entire peritoneum and the incisional wound so that the entire colon is covered by the great omentum, and is practically shut off from

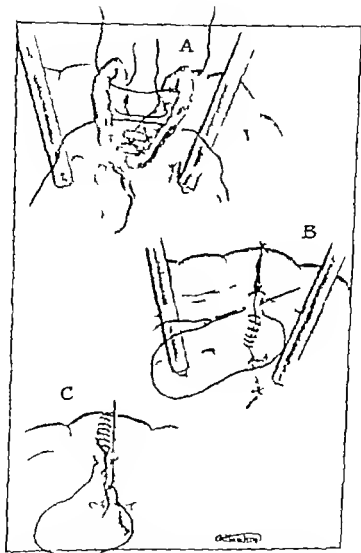


Fig. 325—*A* Location of first sutures. These are through-and through interrupted sutures. *B* Simple over and over suture going through all the coats, mucosa, muscularis, and peritoneum. *C* A trial closing suture of sized silk is placed around the bowel.

the general abdominal cavity (Fig 327). Leakage is practically impossible by this method. Not only does this omental covering

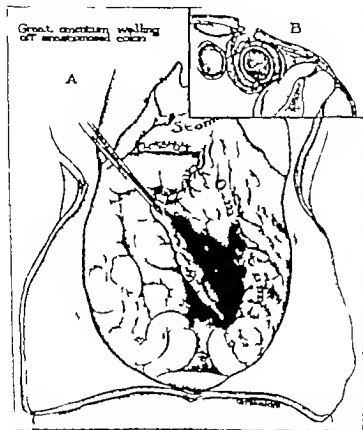


Fig 326—A The great omentum is divided between ligatures on the right side near the pyloric end of the stomach, so as to allow it to swing freely over the field of operation. B Cross-section showing how great omentum is tucked over the entire area here the anastomosis is made, and reflected back to the parietal peritoneum of the incision.

protect the general peritoneal cavity from leakage but it also prevents the small intestines from becoming adherent to the anastomosed area of the bowel where slight leakage may occur

and it gives a new collateral circulation by the blood-vessels from the omentum perforating and becoming anastomosed with

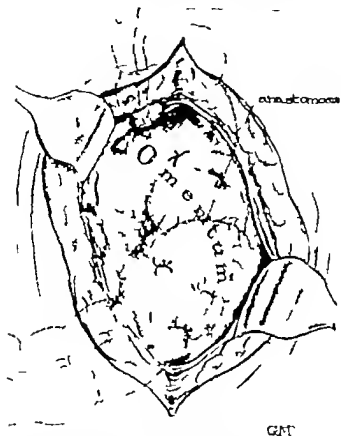


Fig. 327.—Omentum is sutured around the cut peritoneum and the incisional wound, so that the entire colon is covered by the greater omentum and is practically shut off from the general abdominal cavity.

those in the bowel wall giving it greater vitality. The abdomen is closed with the exception of a slight strip of gutta serena for drainage down to the omentum.

I want to show you a patient on whom I operated eight years ago. This woman had what appeared to be an inoperable mass (carcinoma) in the ascending colon midway between the hepatic flexure and the cecum.

I carried out the following procedure. A right rectus incision was made. On account of the shortness of the great omentum

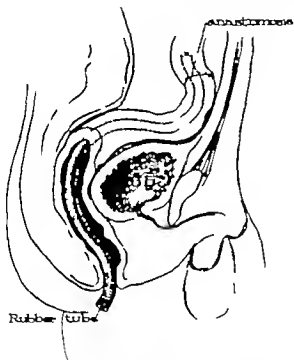


Fig. 328 — Diagram showing site of anastomosis and rubber tube which was sutured in at the time the anastomosis was made.

I amputated practically all of the great omentum between ligatures. This free transplant of the great omentum was sutured around the entire mass and also to the parietal peritoneum so as to wall off the entire mass from the free peritoneal cavity. A metal blade (Fig. 329) which fitted into the incision just as a lid fits on a kitchen boiler allowed the carcinoma to be treated

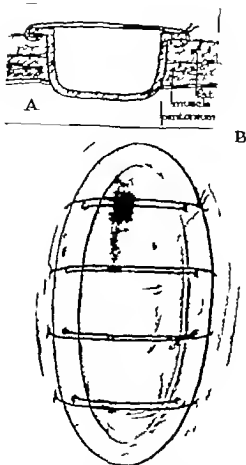


Fig. 329.—A, Cross-section showing box lid fits into abdominal cavity. B, Diagram showing organ covered by metal blade. This blade is fitted into the incision just as lid fits on kitchen boiler, allowing the carcinoma to be treated by x-ray as often as necessary by simply removing the lid from the abdominal wound.

by x-ray as often as necessary by simply removing the lid from the abdominal wound. Before however putting on the lid

each time the omentum was lined with rubber dental tissue and the cavity filled with sterile vaselin. The cecum was then picked up through a gridiron incision and a temporary cecostomy performed. Three months later through the primary incision the entire ascending colon and cecum with the mass were removed. The omental transplant which was still adherent to the parietal peritoneum, was utilized to cover up the closure of the bowel and the anastomosis between ileum and transverse colon. The cecostomy wound and the original wound through which the resection was performed were closed. A slight drainage of gutta-percha was placed down to the omentum. The patient made an uneventful recovery. She is as you see a well-nourished woman. It is eight years since the operation. She has had one child since and she is 40 pounds heavier than she has ever been.

The point that I want to bring out in this procedure is first, conservative method of exposing the apparently inoperable mass to x-ray treatment in addition to a primary cecostomy and then going in three months later and doing a radical operation with an end-to-end ileocolostomy without the slightest difficulty. I believe the exposure of very large carcinomatous masses that have infiltrated the surrounding tissue are well treated by x-ray before removal by this method of exposing the mass through an open wound held open by means of a metal lid as I have demonstrated in this procedure.

CLINIC OF DR. HUGH McKENNA

ST. JOSEPH'S HOSPITAL

ANEURYSM OF THE POPLITEAL ARTERY

Aneurysm of Popliteal Artery Following a Slight Trauma to the Under Surface of the Thigh. Treatment. Discussion on Aneurysm.

Presentation of Patients Showing End-results in Operation for Fracture of the Long Bones and Operation on an Intracapsular Fracture of the Neck of the Femur

PATIENT F S W white, male, aged forty five entered the hospital January 14 1921

Complaint.—Pain in calf of left leg and foot, with disturbed circulation in the leg and foot inability to walk on account of this pain.

Onset.—About two years ago the patient was trying to close a trunk by sitting on it and jarring it down, striking the under surface of his thigh on the outer edge of the cover of the trunk. A short time after in walking down the street he noticed pain in the calf of his left leg. He has had this pain off and on ever since though at periods he is entirely relieved. The pain is of a dull aching character beginning in the calf and going down on the inner surface of the leg to the toes. He says the pain is particularly severe in his toes, and especially in his great toe. The pain in the great toe becomes finally very dull until this part becomes numb. This condition occurs usually early in the morning, and he states that at this time there is no discoloration of the calf of his leg or foot. Patient claims that the blueness caused by disturbance of the circulation in his foot and leg has developed recently. At the present time he is unable to walk

of infection and therefore set about hunting for a focus responsible for this condition.

The Roentgen examination showed evidence of some infection in the apical ends of some of the teeth. The Roentgen examination of the left leg was negative. The tarsal bones of the left foot showed a tendency to tipping and spur formation. The roentgenologist interpreted this as a hypertrophic arthritis.

During this period the pain was so severe in the leg and foot that the member was placed in a fracture-box filled with cotton and dry warmth was applied by means of an electric heater. On January 19th a linear rash came out along the medial and anterior surface of the leg which corresponded to the position of the internal saphenous nerve. The diagnosis of herpes zoster was accordingly made. This was treated by means of dusting powder and of collodion dressings. The patient gained considerable relief with the appearance of the rash which relief lasted for a period of a week at which time he was discharged from the hospital. After returning to his home the pain recurred in the foot and leg and this time it had all the characteristics of a postherpetic pain. The pain was not of so severe a nature as to prevent the patient being about and reporting at the office from time to time. In a careful examination on January 25th there was a slight suspicion of an indurated area in the upper portion of the popliteal space and though this portion of the leg had been repeatedly examined by myself and consultants and though x ray pictures of the complete leg and thigh had been taken it was deemed advisable to repeat the x ray examination, directing especial attention to the upper part of the popliteal space.

The accompanying skiagrams (Figs. 330-331) tell their own story showing a deposition of salts laid down in concentric layers in this position and a dilated blood vessel in the upper part of the popliteal space the dilatation continuing up into the lower part of the femoral vein. From this evidence a diagnosis of an aneurysm of the popliteal artery was made. Owing to the seriousness of the condition a consultation was held with

owing to the swelling in his leg, which is very marked but which does not extend into the foot or toes. He does not think that the swelling is affected by allowing the foot to hang down or be placed in an elevated position.

Past History—He has had the usual diseases of childhood no other sicknesses of any kind, and no other accidents besides the one mentioned.

Family History—Father died at the age of seventy-seven of heart disease. Mother died of diabetes at age of seventy-seven. Four sisters and five brothers are living and well no history of tuberculosis or carcinoma in the family. Venereal history is negative.

Eyes and ears are normal. Tonsils have been removed.

Chest There is no shortness of breath or palpitation of the heart.

Gastro-intestinal tract is negative.

Habits.—Nothing of importance.

Physical Findings.—*General*—A well-developed white male about forty-three years of age who is apparently in good physical condition complaining of pain in his left leg, feet, and toes.

Regional—Eyes react properly to light otherwise negative. Teeth are in fair condition. Sinuses are negative. Skin is warm moist, and elastic some discolored areas over left foot and calf of the leg patches along the anterior and inner surface of the leg some of which are the size of a dime.

Chest—Lungs and heart are negative.

Abdomen is negative.

Reflexes.—All are present.

This patient applied to me for treatment a year and a half previously suffering from pain in the left leg and after a careful examination, including x rays, he was referred to one of the leading neurologists in the city who examined him carefully and kept him under treatment for a short period at which time the patient made some improvement and was not seen again by me until he entered the hospital on the date given above. We were of the opinion at this time that he was suffering from some form

of the wound leaving no bleeding points. The aneurysm (Fig 332) was of the fusiform type even though the major portion of the tumor was on the posterior side of the vessel which anatomic position was produced because of the proximity of the tumor to the underlying bone thereby preventing the expansion in an anterior direction. The aneurysmal sac was filled with broken-down, degenerated blood-clots, which had unquestionably existed for a considerable period of time. It was apparent at the time of the operation that the collateral circulation was



Fig. 332.—Photograph of aneurysm after removal.

well established and great care was exercised not to disturb these small vessels. I wish to lay considerable stress upon the question of surgical technique that is free from traumatizing action, as I believe the outcome of such operations is dependent upon the ability of the operator to complete this procedure with a minimum amount of trauma.

This patient is brought into the clinic this morning to show the final result nearly a year after the operation.

In looking over the literature on the general subject of

Dr Arthur Dean Bevan and Dr Hugh T Patrick. All were agreed that this was an aneurysm, and that the only safe procedure was the institution of surgical intervention. Accordingly the patient was sent to the hospital.

He was admitted to St. Joseph's Hospital on March 30th and operation was performed on March 31st. The operation consisted



Fig. 330 - Roentgenogram (Case I) lateral view showing aneurysm. Note that the dilated vessel was in the upper part of the popliteal space, the aneurysm continuing up into the lower part of the femoral vein.



Fig. 331 - Roentgenogram (Case I) stereoposterior view.

in an extensive incision along the border of the semitendinosus muscle of the left leg cutting down upon the aneurysmal sac which was easily located by palpation. Careful dissection of the small anastomotic vessels about the mass. Careful dissection of the sac with practically no hemorrhage. Ligation was performed proximal and distal to the aneurysm, with excision of the sac. Closure

before the greatest amount of care should be exercised in order to prevent undue traumatism

Before concluding the clinic this morning I wish to show you some interesting end results in the operative treatment of fractures of the long bones

As I have repeatedly said in previous clinics the question of showing pathologic conditions of bones and joints and particularly where they have been immediately restored to proper



Fig. 133.—Roentgenogram showing comminuted fracture through the head of the right humerus. The head was divided into two fractures, the lower fragment being the larger. The lower half of the head is displaced downward and inward, the upper half upward, outward, and forward. The shaft is displaced upward, outward, and forward.

position and function is interesting but the point of prime importance to the medical profession is to learn something of the ultimate result of these conditions. I therefore wish to present 2 patients with their accompanying x-ray pictures and photographs which represent the end-results in fractures to the humerus.

The first patient Mrs. F. O. aged fifty entered the hospital September 8, 1921 following an accident in which the auto-

aneurysm a very thorough review has been made by Drs. Baldwin Lucke and Marion H. Rea, *Journal of the American Medical Association*, September 21 1921 and I quote from that article Ouler's definition of aneurysm "A tumor containing blood in direct contact with the cavity of the heart, the surface of a valve, or the lumen of an artery." This article deals with aneurysm, particularly following disease and therefore may not be of any particular interest in the report of a traumatic aneurysm only in so far as the general subject is of interest. The following statistics from Lucke-Rea's paper is of interest.

In a review of 160 145 postmortem examinations 1452 aneurysms were encountered or 1 to each 111 persons equals 0.9 per cent. Some of their conclusions are of interest. Aneurysm is more common among the Anglo-Saxon than the Teutonic races. It is most common during the fourth and fifth decades. It occurs earlier in the negro. It is more common among negroes than among the Caucasian race. It is four times more frequent in males than in females. In a report on 12,000 postmortems at the Philadelphia General Hospital based upon 321 intra corporeal aneurysms the diagnosis was made in 43 per cent. of the cases.

In the report of Dr. A. MacLaren (*Annals of Surgery* September 1921) he quotes from Gibbon which I believe is of interest and is sane teaching "Arterioplasty seldom safe or necessary." In the same article Dr. MacLaren suggests obliterative aneurysmorrhaphy as the choice method of procedure. In a report by Dr. William Ott from the Mayo Clinic (*Annals of Surgery* November 1921) this report seems to show that the best results were obtained especially in the smaller vessels by proximal and distal ligation and division of the aneurysmal sac.

In conclusion, I wish to state that on the basis of the review of the literature made it would seem advisable in the traumatic type of aneurysm not to operate too early unless, first gangrene seems imminent or second infection sets in that the treatment of choice is rest, with aid to the circulation by position and time allowed for the collateral circulation to become established and when operative procedure is finally instituted as I have stated

skill. These fragments were maintained in position and in alignment with the shaft of the humerus by means of two nails that still show in the roentgenograms. Lane technic was used throughout. Closure in the ordinary manner. Plaster-of-Paris cast applied. The accompanying roentgenogram (Fig. 334) shows the complete bony union of the fragments in relatively good position, while the photograph (Fig. 335) shows the degree of motion which is practically normal.



Fig. 335 — Photograph taken seven months after operation, showing the degree of motion in right arm and the extent to which patient can raise the arm.

The second case is a similar one, the patient coming to the hospital following an accident with a fracture at the surgical neck of the left humerus with the head completely dislocated out of the joint (Fig. 336) and which fragment was reduced by open operation and secured in place by the use of two nails driven into the fragments at different angles. The operative history is as follows:

Open operation, reducing the head of the humerus by manipulation, bringing the distal fragment in line with the proximal using careful instrumentation within the joint so as not to injure

mobile in which she was riding was demolished by a railroad train. The Roentgen findings were as follows. Comminuted fracture through the head of the right humerus the head was fractured, dividing it into two fragments (Fig. 333) the lower fragment is the larger the lower half of the head is displaced downward and inward the upper half of the head is displaced upward, outward and forward the shaft is displaced upward outward, and forward. The scapula is negative for fracture and the clavicle shows no fracture. The left forearm showed a comminuted fracture through the distal end of the left radius the



Fig. 334—Roentgenogram showing head reconstructed

fracture extends into the joint the styloid is displaced outward and anteriorly the styloid process of the left ulna is fractured and displaced inward. The general position of the fragment is good.

Clinically the comminuted head of the right humerus was dislocated, and because of the comminution only one line of procedure could be followed that of open operation, for its reduction and alignment.

Operation consisted in cutting down and manipulating the fragments of the head back into the fossa by means of a Lane

the synovial covering of the joint and securing the fragments in place by means of two wire nails. Lane technic was carried out religiously throughout.

A second roentgenogram (Fig. 337) is reported to show bony union complete and the function of the joint entirely normal.

The third case is a so-called intracapsular fracture of the right femur (Fig. 339) and because of the position, high in the



Fig. 338.—Photograph showing extent to which patient can raise arms. Extension and motion are practically normal.

neck, the blood-supply is disturbed to a degree where a good result will only be obtained by the interposition of an autogenous bone transplant, which in my opinion is the operation of choice in fractures of the neck of the femur. I am very partial to this form of treatment in patients that are of the proper age and physical condition to undergo an operation of this character. I am of the belief that the transplant first fixes the fragments in



Fig. 336.—Roentgenogram of left hemipelvis of second patient, showing fractures at the surgical neck of the left humerus, with the head completely dislocated out of the joint.



Fig. 337.—Roentgenogram taken after operation showing how head has been reconstructed.

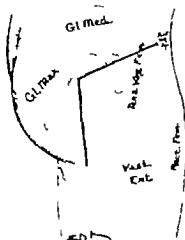


Fig. 340.—Incision for exposure of fracture of the femur

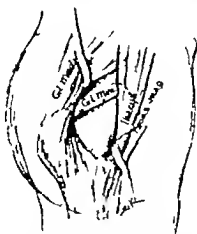


Fig. 341.—Diagram showing exposure of field.

the great trochanter. The base of the triangle I make up by the intertrochanteric line. I am of the opinion that this method of approach to the hip-joint is very desirable as no structures

place during the period of callus formation and mechanically prevents absorption of the neck which practically always takes place in conditions not treated by this method, and second, the introduction of a large autogenous transplant with its accompanying periosteum permits the establishment of a blood-supply in the head of the femur much more quickly and more efficiently than is possible in any other way



Fig. 390.—Roentgenogram showing intracapsular fracture of the right femur

The incision used in approaching the hip-joint is an L-shaped incision which exposes the anterior surface of the neck of the femur through a triangle which I have described as follows. The inner leg of the triangle is made up by the tendons of the psoas and iliacus muscles as they come down over the joint to be inserted into the lesser trochanter. The upper and external leg of the triangle is made up by the tendon of the gluteus minimus muscle as it comes out to be inserted in the upper portion of

In the roentgenogram (Fig. 343) at this time practically five years after operation, that the compact tissue of the outer surface of the femur is continued into and apparently incorporated in the transplant which extends through the middle of the neck into the head of the femur.

In closing the discussion I cannot help saying a word respecting the necessity of bone and joint surgery requiring a special



Fig. 343.—Roentgenogram of patient operated on five years previously for an intracapsular fracture of the femur operated by the method employed in the previous case. Note how the head has re-united and how the compact tissue of the outer surface of the femur is continued into and apparently incorporated in the transplant which extends through the middle of the neck into the head of the femur.

surgical technic for its performance. With the resulting number of infections that occur in this kind of work throughout the country I think the time has arrived when those devoting a large amount of time to this branch of surgery should dwell more upon the importance of special preparation for surgeons who desire to follow this particular specialty.

of any importance are encountered in the line of incision and the position of the fragments, particularly in those conditions in which the head of the femur has been turned, may be brought into proper alignment with more ease and precision than with any other incision.



Fig. 342.—Roentgenogram taken after operation showing fragment secured in position by an autogenous bone-graft containing its periosteum.

I present in closing this clinic the end-result in the type of case just operated upon for a similar condition operated five years ago the patient then sixty-two years of age whose function is complete in every way and the accompanying roentgenogram shows how beautifully the head has tilted and the trans plant which was taken from the tibia of the same patient has been incorporated into the bone of the neck. It is of interest to note

CLINIC OF DR. CARL B. DAVIS

PRESEYTERIAK HOSPITAL

TWO CASES OF ILEOSIGMOIDOSTOMY

Colitis and Its Surgical Management. Report of Cases Treated by Ileosigmoidostomy

COLITIS one of the common lesions seen by every physician at times is a most trying condition that taxes the endurance of the medical man as well as the patient. The symptomatology varies from a slight discomfort in various portions of the colon to prostration and exhaustion in some of the more severe forms.

The condition is relieved frequently by some form of medical management only to return after varying intervals in all its intensity. The internist has had better results than the surgeon in treating most forms of colitis. The persistence or recurrence of symptoms has influenced the physician to resort to various types of surgical interference in some patients. Among these procedures the so-called short-circuiting technic of Lane, or ileosigmoidostomy has been employed.

The lower ileum has been united with the sigmoid colon without any other effort at control of the intestinal current. Barium meals traced with the fluoroscope may pass along the entire course of the colon independent of the anastomosis or the side-tracked loop of large bowel may fill with inspissated contents and the intestinal current pass by way of the anastomosis. In an effort to void the stasis of intestinal material in the loop of large bowel the ileum has been resected at a point close to the ileocecal valve and the anastomosis made with the sigmoid. This scheme however is equally unsatisfactory as retrograde peristalsis carries the contents backward in the large

for persistent colitis with marked distress showed at secondary operation that the ileum having been resected at the ileocecal valve and carried across the abdomen was anastomosed to the

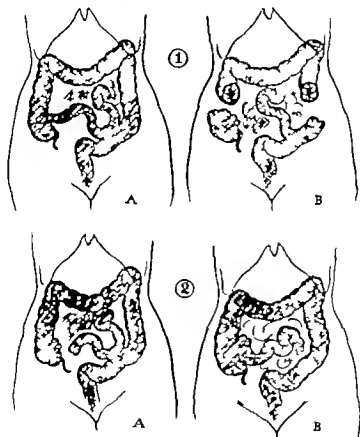


Fig 34A.—1 A On this patient an ordinary ileosigmoidostomy had been done. B To detract the entire colon and provide irrigation the relationship was modified as shown here. 2 A This patient entered the hospital with the condition as illustrated. B Normal relations established.

sigmoid with about a foot of the ileum protruding distal to the line of union. This redundant portion of small bowel had distended until it was about 4 inches in diameter. During peristalsis

gut and masses of hardened feces accumulate in the ascending and transverse colon.

In addition to the deposition of solid material in the blind loop there is at times an intermittent accumulation of gas much like that seen in Hirschsprung's disease or megacolon. The symptoms are so similar at times that it seems we might be justified in classing some of these cases as acquired megacolons. The abdomen distends to a marked degree, simulating the appearance of a late pregnancy. The patient suffers with colicky pains. Relief comes as soon as the gas is expelled. Increased peristalsis is seen and felt. One patient described the sensation as that of vigorous fetal movements. Another likened it to the writhing of a snake in her abdomen.

The result of this procedure at times has been a patient in worse condition than existed originally. One patient after being subjected to an ileosigmoidostomy developed so much distress from gas distention that she voluntarily restricted her diet until a marked loss in weight and strength occurred and a phthisis developed. During the night and forenoon the abdomen distended with gas until respiration was interfered with. A series of enemas was used daily until the gas passed, and in this way a fairly comfortable afternoon and evening were obtained. Most of the patient's energy was consumed in the forenoon struggle, and the remainder of the day was passed in bed or a wheel chair. For a number of months before secondary operation the patient was under most competent medical management yet obtained but little relief. With local anesthesia and gas the abdomen was explored. The ileum at a point about 10 inches proximal to the cecum was found attached to the sigmoid colon. The ileum was resected distal to the anastomosis and the ileocecal region brought through the abdomen. The large bowel was resected proximal to the anastomosis and the proximal end brought through the abdominal wall. Following this procedure the gas disappeared and the bowels moved without artificial aid. The patient died from her lung condition before restoration of strength.

A second patient who had been given an ileosigmoidostomy

